A Critical Guide To

IDEAS THAT MOVED THE WORLD

(HORACE SHIPP)

By

Prof. M. P. VASHISTH, M. A.
MAHARAJA'S COLLEGE, JAIPUR

1953 ★ Rs. 2

The Students' Book Company
BOOKSELLERS & PUBLISHERS
Chaura Rasta JAIPUR
Sojati Gate JODHPUR

A Critical Guide To IDEAS THAT MOVED THE WORLD

(HORACE SHIPP)

Containing-main points of each and every Chapter, Detailed Summary & General Questions with Answers.

By

M. P. VASISHTH, M. A.

MAHARAJA'S COLLEGE, JAIPUR

The Students' Book Company

BOOKSELLERS & PUBLISHERS

Jaipur Jodhpur

1953 Price Rs. 2/-

CONTENTS

CHAPTERS **PAG**

Ideas That Moved The World

Copernicus, Bruno, Galileo.

Main Points:—

(i) Birth and education of Copernicus and his observations on stars.

(ii) He wrote a book "Concerning the Revolutions of the Heavenly Bodies", but it remained unpublished for full thirty years.

(iii) He published only an outline of the theory being afraid of the persecution of the church. However, none took his views seriously.

(iv) The book was ultimately published through Osiander's efforts but at a time when Copernicus was on his death-bed.

(v) Copernicus expounded his new Theory of astronomy in face of the established and universally accepted opinion of the Bible, the Church, and Ptolemy of Alexandria.

(vi) Bruno was the next man to give free expression to the observations of Copernicus, for which he was not only confined in a dungeon, but burnt alive at the stake.

(vii) Next came Galileo. He made certain observations through a telescope and declared himself in favour of the views of Copernicus.

(viii) He too was tried for this heresy and passed his remaining years in a dungeon.

Summary :—

Nicolaus Copernicus, born at Thorn in Poland, studied at the University of Cracow and then proceeded to Italy to study at Bologna and Padua. He mastered subject after subject in quick succession, and threw himself heart and soul into the study of astronomy. He took up an appointment in a Cathedral where his uncle the Bishop left him free to pursue his astronomical studies. In a room on the tower of the Cathedral, from an opening in the wall, he observed the movement of the stars, and reached the conclusion that the earth and all other planets moved round the sun. He whispered this knowledge to a few chosen friends, but even these laughed and considered his views wholly fantastic. The obvious fact to the people was that the sun and other planets revolved round the earth. Aristotle, the great Greek philosopher, had been of that view too. Both the Bible and the Church had

upheld the doctrine of the world as the centre of the universe. In the second century A. D., Ptolemy of Alexandria, had also collected into his book, "Almagest", the current ideas of astronomy. For thirteen hundred years that book was universally accepted as the Bible of astronomy. It took earth to be the centre of the universe, and thought of planets and the sun as bodies revolving round it. The book was very popular, and had been translated in to many languages, including Arabic. In face of all these established opinions, Copernicus still clung steadfastly to his own discovery..

At the age of forty, he wrote a book "Concerning the Revolutions of the Heavenly Bodies", which contained his new astronomical discoveries. He hesitated to publish the book, being in terror of the persecution of the church, which generally resulted in imprisonment, torture, or the choice between recantation and death at the stake.

At one time, Copernicus mustered courage to publish an outline of his theory. It had a strange reception. Pope, Leo the Tenth, found it an amusing idea, and though the entire papal court liked it, yet none took it for truth. Only Rheticus from Wittenberg University had come to watch his observations, and was so fascinated by them that he stayed for three years instead of the three months he had intended.

Thirty years elapsed, during which period, Copernicus spent a very busy time because of his multifarious duties as a Canon, physician and economist. His uncle the Bishop breathed his last, and Copernicus had to work for seven years under Danticus, who always censured and persecuted him. This was the most unhappy period of his life.

Then came his friend Osiander to him with the proposal that he should publish his book with a preface, saying that this was only a fantastic idea, but might prove an interesting exercise for mathematicians and astronomers. Copernicus spurned this idea and ultimately Osiander agreed to publish the book as it was. As soon as it was published, a messenger was rushed to the author, who was now on his death-bed. We can imagine the smile with which the author must have greeted the book before passing through the gate of death, "away beyond the tortures of the Inquisition", and the fury of the church, never seeing the treacherous preface which Osiander had slipped in.

The story of this ecelesiastic, physician, lawyer, scientist, mathematician, above all an astronomer, tells us how truth was withheld through fear of persecution, though revealed at last.

Seven years after the death of Copernicus, a new champion of this theory was born at Naples. His name was Giordano Bruno. He was a Dominican monk, but at twenty-four, he fled from his monastery in terror of persecution. He visited city after city in Europe, proclaiming his ideas to the people on new astronomy. He struck at the very roof of the Biblical idea of man as the crown of creation. He was, therefore, accused of heresy and imprisoned in Venice by the Church for full six years. He was kept in dungeons and asked to recant. He refused and was therefore burnt at the stake. He thus became a martyr to truth.

Galileo had already made himself a champion of this new idea. When the news of Bruno's death reached him, he was a little frightened, but he continued his research in astronomy. Four years later, he observed a new star and his popularity increased immensely. He was the first man to use a telescope, manufactured by a Dutch, despite the Church assertion that it was an instrument of the devil. Astronomers of his age also refused to look through such an instrument, but Galileo persisted. He observed through it several phases of Venus like that of the moon. Study of sun spots showed him that even the sun revolved. He saw Jupiter's moons and numerous other marvels of the sky.

In 1616, the College of Cardinals declared Copernican theory to be a heresy, and Galileo fearing persecution, promised not to teach it. A new Pope was elected, and Galileo mistaking him for a tolerant fellow, wrote a dialogue between the Ptolemaic and the Copernican ideas, in which under a veil, he tried to ridicule the former theory, though pretending to condemn the latter. The truth could not be concealed. Galileo, now approaching seventy, had to face the Inquisition. He was made to recant the truth, but the legend tells us that he murmured after his recantation, "E pur Si muove." ("And still it moves.") For nine more years, blind and helpless, Galileo was kept in prison where he breathed his last.

In the Seventeenth century, Keppler established the idea of the elliptical movement of the planets, and for ever, silenced the doubters.

Questions & Answers.

Q. 1. *"But the stake and the cross never kill the truth." How far is this true of Bruno and Galileo ?*

Ans. These words of Horace Shipp, the author of "The Ideas That Moved The World", bear a pointed reference to the martyrdom of Giordano Bruno. A monk he was, but fled from his monastery in dread of the persecution of the Church, on account of his new and unorthodox views on astronomy. He proclaimed these ideas to the people of Europe in course of his tour. He was arrested in Venice and confined in a dungeon for full six years. He was constantly tortured and asked by theologians and monks to recant. But he refused to yield. Therefore, in the year 1600, he was burnt alive at the stake for not renouncing the truth, considered a heresy by the Church. What is thrilling about his death is, that amid the burning flames, when he was offered a Crucifix to kiss so as to save himself from eternal damnation, he retorted on his judges in a manner characteristic of his heroic soul:

"You who sentence me are in greater fear than I who am condemned".

Byron said, "They never fail who die in a great cause." And thus Bruno has made himself immortal by cleaving to the truth that Copenicus had discovered, and laid down his life for it.

His martyrdom sets us a-thinking. Is it possible to kill the truth through torture and persecution ? Is it not that violence recoils upon the violent with doubled fury ? Tyranny, however violent it might be, can never kill truth, which sprouts more, the more it is nipped in the bud. But the seekers of truth never think of the dangers ahead. Count Rumford has rightly said, "The enterprising seldom regard dangers, and are never dismayed by them; and they consider difficulties but to see how they are to be overcome".

Galileo too suffered for his devotion to truth and reason. He was made to live in torment in a dungeon until he breathed his last. For all this persecution, truth shone with greater effulgence, and completety overwhelmed the scepticisim of the tyrants. Thus we find that the stake and the cross can never kill the truth.

Q. 2. "*It was left for another brilliant mind, another more courageous man, at the cost of his liberty and his life, to press home that truth.*" *Explain.*

Ans. These lines have been written by Horace Shipp in praise of G. Bruno. We know that Copernicus failed to publish his book on astronomy for fear of facing the Inquisition. Therefore, the truth was withheld from humanity, and it came out only when

Copernicus was on his death bed, ready to pass through the gateway of death, so as to be beyond the wrath of the church and "the sneers of the dull scholars sunk in age-old untruth."

Bruno, his successor was a man of different mettle. He held aloft the torch of truth handed on to him by Copernicus. He was a man with a courageous soul and, therefore, fearlessly expounded to the huge gatherings of people, the Copernican views on astronomy. No doubt, he incurred the wrath of the church and lost his life, but in return won immortal renown, and saved the truth "to perish never". The following lines of Milton serve as a fitting tribute to him;

Servant of God, well done? well hast thou fought
The better fight, who single hast maintain'd
Against revolted multitudes the cause of truth.

Q. 3. "*It is a poor mind that will think with the multitude because it is multitude, truth is not altered by the opinions of the vulgar orthe confirmatiou of the many.*"

G. Bruno

Elucidate the above.

Ans. It was Rivarol who once said, "It has been very truly said that the mob has many heads, but no brains." Shakespeare too made it crystal clear in "Julius Caesar" that the mob is very fickle in its views, and is invariably guided by passion and sentiment instead of reason. G. Bruno too was of the same view. A seeker of truth can never attain his goal by pinning his faith on the opinion of the many or the multitude. Flashes of inspiration that visit a genius, never come to a surging crowd, nor can we expect from it what Pasteur worded as" a lasting provision of faith and fire." Truth requires constant search and suffering and can strike root only in a soul, suffused with an ardent desire for its discovery. If the scientists had taken for truth what tradition and popular opinion gave them, there would have been little or no advancement of knowledge. Not only they had to sail against the tide of popular opinion, but many times they had t~ bring hornet's nest about their ears, and court persecution and death. If a man relies solely on popular opinion, he can never imbibe a spirit of enquiry and inquisitiveness, which disunguishes a man from a beast. Lives of Copernicus, Bruno and Galileo are all illustrations bringing home this truth to us with much point and force. History teems with names of a thousand and one personages, who stood dauntless and tower like against. the opinion that had the "confirmation of the many." We should bear in

dations for the scientific discoveries of the ages of mechanical triumph which followed."

Newton, the scientist, who was always arduously applying himself to researches in science, lacked in the emotional counterpart In this respect he can be compared with He-Ancients in Bernard Shaw's "Methuselah". But to balance this drawback, he possessed enormous capacity for concentration which stood him in good stead in his studies.

But Newton was soon weaned from science. This was rather unfortunate. In the latter half of his life, he devoted himself to studies of Biblical chronology, based on the idea that the world was created in the year 4004 B.C Then he worked as master of the Mint. Thus, the man who was rendering yeoman's service to science, was allured to other fields and "pastures." That diverted his energy into non-scientific channels.

Questions With Answers

Q. 1. *What are the three revolutionary discoveries made by Newton in his early twenties? Explain.*

Ans. Issac Newton's father had expired just before his birth. Therefore, his mother found it difficult to keep the boy at school. She removed him to her farm, but on the insistence and advice of her friends, she sent him to Cambridge at the age of nineteen. Newton worked on the farm for some time in keeping with his mother's wishes, but his mind was always actively engaged in the thought of some new "gadget".

It was at Cambridge that Newton found himself. At the age of twenty, he began to work assiduously on the discovery of natural laws. It was in the three subsequent years, just in the very prime of his life, that Newton made himself an heir to immortal fame by virtue of his astounding discoveries. It was the age at which Milton bemoaned for lack of sufficient gifts.

It was in 1664, at rhe age of twecnytwo, that Newton made his famous experiment with a prism, which revealed to him the nature of light. His researches on light have proved of tremendous value to science. His chief accomplishment in this field was the analysis of the composition of light, which he found to be a combination of various rays causing different colour sensations, white light being a mixture of all these. It was at this time that he wrote his famous book on opticks. All these achievements

brought him the crowning glory of his life, namely, his membership of the Royal Society, which was founded then recently.

In his twenty third year, Newton returned home to Woolsthorpe as there was an outbreak of plague at Cambridge. It was here that he proved the mathematical laws of gravitation which had been roughly investigated by Galileo. As his niece said, this vital truth of the law of gravitation struck Newton while he was sitting in his Lincolnshire garden. There he saw an apple falling from a tree, and through this phenomenon discovered the laws of gravitation. But Newton did not end his pursuit there. He further improved and enlarged upon the idea, and very emphatically did he declare that everything had a mathematically measurable cause which would give a mathematically predictable effect. From measurement of time and space, he worked out laws of movements between bodies which controlled the movement of the earth, the moon and the stars. Galileo did know that the stars moved through the heavens. But why did they move and why do things move? An answer to this riddle was supplied by this genius.

Besides his passion for exact measurement and deducing everything to mathematical laws, Newton also invented the differential calculus. With the help of this complicated process, he had the power to measure things which could not have been measured before.

It was by virtue of the discovery of these three mathematical laws, that Newton earned for himself, "a name to resound for ages". To quote the writer himself, these discoveries are, "the law of optics and the composition of light; the laws of dynamics and of gravity; and the mathematical method of differential calculus which enabled later scientists to continue his vast work of exact measurement of speed and accleration."

Q. 2. *"I have been but as a child playing on the seashore, now finding some prettier pebble or more beautiful shell than my companions. but the unbounded ocean of truth lay undiscovered before me." Illustrate the truth of this remark with reference to Newton's own discoveries.*

Ans.—Horace, the wise, once said, "one can not know everything." This very idea also echoes from Newton's own words. The sea of knowledge is very vast and deep, and no explorer can ever traverse its vast extent or fathom its depth.

What one can do is to play on the sea beach and gather a few pebbles here and there. This is what Newton also did.

The above remark also brings to light a high degree of modesty which marked Newton to the end of his life. Though a genius, he was never puffed up with the pride of immense knowledge he had, and which he has transmitted to posterity.

Newton's superiority as a scientist can not be challenged. He was the supreme master mind of his age in the realm of science. To him are attributed the three revolutionary discoveries, which are in his own words like three pebbles or shells found in his wanderings on the sea shore of knowledge.

These three discoveries have proved so mighty that they have stirred the world of thought to its depths, and have enabled humanity to march ahead with vigorous strides on the road to progress.

(For the three discoveries, see Q. No. 1)

Foundations Of Physiology

WILLIAM HARVEY

Main Points:—

(1) Seventeenth century marks the beginning of the modern age of science and the close of the Middle ages.

(2) Meetings of scientists were being held in London and at Oxford to discuss purely scientific subjects.

(3) Such meetings were a novelty in those days, and Charles II encouraged the scientists by founding the Royal Society.

(4) It was then that William Harvey discovered his theory of circulation of blood, and established physiology on a sound basis.

(5) William Harvey first studied at Cambridge, and later joined the University of Padua to study Medical Science.

(6) From Padua he returned to London where he made valuable experiments in anatomy. He was appointed to St. Bartholomew's Hospital in 1609, and later on appointed as Lumleian Lecturer to the college of Physicians.

(7) In 1616, Harvey expounded his discovery of the flow of blood and the structure of the heart to a gathering of elites, and overthrew the established theories of Aristotle and Galen.

(8) In 1628, Harvey published his theory in the form of a book, which resulted immediately in the fall of his private practice as a Doctor.

(9) Popular opinion rebelled against Harvey's new ideas. Once a mob broke into his house also, but his intrepid soul pursued his researches ceaselessly, and laid the entire humanity under his debt.

Summary:—

The seventeenth century marks the beginning of the modern scientific age and the close of the Middle Ages. Superstition, blind faith in dogmas, irrational ways of thinking, suffered a crushing defeat before the mighty forces of science. It was then that people began to look to exact measurement, definite natural laws and scientific reasoning.

This century witnessed the birth of the Royal Society also which flourished under the patronage of Charles II. 'It came into being in 1662. Under its auspices, scientific problems were discussed and debated by doctors, mathematicians and mechanicians alike. Even before this a club of scientists had come into existence and tackled purely scientific problems at its meetings at the house of a certain Dr. Goddard. Later on, this group of young men moved to Oxford, and conducted its deliberations under the guidance of a certain Mr. John Wilkins.

The spirit of this age found its noble embodiment in Mr. Harvey. Born in a well-to-do family, Mr. William Harvey had the resources to study not only at Cambridge, but also at Padua in Italy, a University very widely known for its researches in medical science. There this science had grown with vigorous strides under two very learned Professors of Anatomy, namely, Vesalius and Fabricius. It was at the feet of the latter that Harvey learnt some of his important lessons in Anatomy.

Mr. Harvey, a young man, returned from Padua to London with the determination to pursue the science of Anatomy. Day and night, for full fourteen years, with great ardour and zest he devoted himself to this noble task, and in 1615, in the capacity of Lumleian Lecturer to the College of Physicians, demonstrated his valuable discoveries.

On this memorable day, he explained his theory of the circulation of blood and the workings of human heart to an enlightend gathering,. Unfortunately, his words did not carry conviction, and being possessed of predilection for pre-existent views and theories, this gathering left the hall not only unconvinced but in a doubting frame of mind.

Pained at this, William Harvey again pursued his task like Sir J. C. Bose, who had to face similar scepticism in his theory of plants as living organisms. After another frui·ful research for thirteen years, he published his discovery in the form of a book. He was now sure of the truth of his observations and confident of their acceptance.

But Dame Fortune had more blows to deal at him. Due to his adherence to this new theory, he lost his practice as a doctor. People accused him of having exercised his influence as King's physician in the acquittal of women who were supposed to be witches. His friendship with Charles I made people inimical to him, because they were gradually growing dissatisfied with the King. In addition to this, when at the battle of Edgemoor, he was sitting under a hedge with the two young princes under his charge, a shower of bullets whizzed past him.

Even more serious than this, a furious crowd broke into his house, and not only escaped with his entire furniture, but carried away the fruits of many years of his unremitting research. How good he was and how much mob fury he had to suffer simply for his advocacy of a new theory ?

This man who became an eye-sore to the people was so charitable at heart that his brother had to keep the purse to prevent him from giving away his money to any person in distress. He also built for the College of Physicians a splendid library. But what a woeful recompense did he get for these angelic qualities?

As the saying goes, "Nc man is hero to his valet", Harvey too met with little reception from his contemporaries. But posterity has hailed him as a pioneer in medical science, which he certainly was. After the Greeks, he was the first man to make his mark in this field.

Questions With Answers.

Q. 1. *What is the greatest legacy left to mankind by Harvey ? Expl.in.*

Or

What, according to you, is the greatest discovery made by William Harvey, and what effects it had on medical science ? Explain.

Ans. After finishing his studies at Cambridge, William Harvey made his way to Padua in Italy to study medical science. This Italian University had earned a very good name in this

branch of science due to the able guidance of Vesalius and Fabricius, the two reputed Professors of Anatomy. The latter was working as Professor when Harvey arrived at Padua.

The anatomical discoveries about the flow of blood made by Fabricius set Harvey a-thiking. Fabricius had already theorised that there were valves which opened only one way. These valves constitute membranous part of onr organ allowing flow of blood in one direction only.

Harvey returned to London full of these new ideas. Fortunately, on his return he was appointed to St. Bartholomew's Hospital, and later on offered the job of Lumleian Lecturer to the College of Physicians. It was in his latter capacity, that on a certain memorable day, he gathered a big audience of surgeons, officials and students to demonstrate his theory on which he had been working zealously until then. No wonder, what he said staggered his hearers. Against the established opinion of Aristotle and Galen, which had been a subject of belief for the past two thousand years, he demonstrated his new theory. Arteries had so far been known to contain pure spirit. But this dark man, with a corpse laid upon his table, proved to the gathering that blood flowed through arteries. His argument was that veins carried blood to the heart, entered on the right side, and thence flooded into the lungs. There the blood was purified by the air in the lungs, and passed to the left side of the heart. From there it was pumped into arteries. and passed around the body again.

Upon this truth Harvey had worked unceasingly for a period of fourteen years. When he found that people showed plenty of scepticism and lack of faith in his conclusions, he worked afresh for a period of thirteen years. He experimented on reptiles, fish, birds and snails. When he was perfectly sure of the truth of his discovery, he published it in the form of a book to which a big Latin title was given in keeping with the practice of his age.

No doubt he suffered a lot for this new startling discovery of his, yet he did not give up his noble attempt. His private practice as a doctor dwindled and people began to whisper against him, but he fearlessly and uneqivocally announced to the world the fruits of his own research.

This is the great legacy or discovery which Harvey has handed down to posterity. Once his theory of the circulation of blood and working of the heart was

accepted, it paved the way for the advancement of physiology and turned it into an exact science. Thus lives Harvey in the annals of medical science, a man devoted to truth and ever-pursuing his goal with single-minded devotion. His life well illustrates, "Deeds, not stones, are the true monument of the great ?"

Q. 2. "*Another realm of human knowledge had been captured by a pioneering spirit which would not be defeated by the prejudice of centuries, or turned aside by popular clamour.*" *In what way does this remark refer to William Harvey ? Explain.*

Ans. Those who sailed their barque against the tide of popular opinion had to suffer defeat or destruction invariably. Such was the case with Bruno and Galileo, Socrates and Lavoisier. Inspite of this latent danger in pronouncing new opinions, the master minds could not reconcile themselves to silence, or place tneir beliefs blindly in the established ideas and practices. Whatever appeared to be the truth to their inquiring minds, was given out by them to their own generation, without any demur or fear. How could they suppress the still small voice of reason within, clamouring for expression ?

Such a pioneering spirit was William Harvey. When he was pursuing his studies at Padua, he came in contact with the greatest anatomists of his generation. A spark was left in his mind, which when fed with proper stuff blazed into a dazzling fire ? Harvey, on his return to London from Padua, began to experiment on the human heart, and uitimately discovered the theory of circulation of blood.

So far people had been fed on quite contrary beliefs. Aristotle, the son of a great physican and, himself a name to remember in this sphere, had never come to such a conclusion. His disciple Galen, who had achieved the distinction of being physician to the Roman emperors Marcus Aureluis and Commdus, ıad explored nothing new and original. So far arteries had een considered to be the seat of spirits, but William Harvey ronounced them to be the very channels which carried blood rom the heart to other parts of the body. It was a daring ssertion, because it not only challenged but struck at the very ot of "Prejuduce of centuries", and gave a death blow to pular belief. But like Bruno, Galileo did not believe in the ews of the multitude, or "the opinion of the vulgar", or "the nfirmation of the many." His faith was in the study of the nirable realm of nature. Why should one take the report

of others on trust, when one had been endowed with a faculty to reason and to find out the truth for himself ?

It is in this respect that Harvey proved a pioneer in the field of medical science. Since his discovery, physiology as a science came into its own. It became exact and scientific. Fresh air as essential to health, food as a nutritive element to the body, were all rightly understood and put on a correct foundation. so far magic, alchemy and church had played a dominant role even in the sphere of medicine. All these were now shown the way out, and medical science was hence forth rightly understood and put in its correct perspective.

It should not at all appear surprising that a few years subsequent to Harvey's death, when microscope was invented, all that Harvey had said was found to be true.

It is due to all this that Harvey stands as an outstanding figure in the domain of medical science, whose services are still remembered with a deep sense of gratitude and appreciation.

Q. 3. *"It were graceful, therefore, with this most spacious and admirable realm of nature before us, and where the reward ever exceeds the promise, did we take the reports of others on trust.........Nature herself is to be addressed, the paths she shows us are to be boldly trodden, for thus and whilst we consult our proper senses shall we penetrate at length into the heart of her mystery."* *Harvey.*

Discuss and prove how far this assertton is applicable to Harvey's own discoveries.

Ans. Harvey was a great admirer and devotee of Naturet He once said: "Nature is a volume of which God is the author." In the above lines also, he has made a very strong plea for a direct approach to Nature, if one wants to probe her mysterious workings. It is by sitting and moving in the plenitude of Nature's own phenomena that one can best dive into her secrets. Knowledge gained solely from books, or some thing taken for granted on the testimony of others, may not enable us to glance through the mysterious veil with which Nature covers herself. Hence, Harvey, an enthusiastic admirer of Nature, chose to study the human body in an independent manner without being biased by the views of the multitude or the opinion of his predecessors. The outcome was that the man won laurels in the field of medical science. Such is always the sweet fruit of hard and ceaseless labour.

accepted, it paved the way for the advancement of physiology and turned it into an exact science. Thus lives Harvey in the annals of medical science, a man devoted to truth and ever-pursuing his goal with single-minded devotion. His life well illustrates, "Deeds, not stones, are the true monument of the great ?"

Q. 2. *"Another realm of human knowledge had been captured by a pioneering spirit which would not be defeated by the prejudice of centuries, or turned aside by popular clamour." In what way does this remark refer to William Harvey ? Explain.*

Ans. Those who sailed their barque against the tide of popular opinion had to suffer defeat or destruction invariably. Such was the case with Bruno and Galileo, Socrates and Lavoisier. Inspite of this latent danger in pronouncing new opinions, the master minds could not reconcile themselves to silence, or place their beliefs blindly in the established ideas and practices. Whatever appeared to be the truth to their inquiring minds, was given out by them to their own generation, without any demur or fear. How could they suppress the still small voice of reason within, clamouring for expression ?

Such a pioneering spirit was William Harvey. When he was pursuing his studies at Padua, he came in contact with the greatest anatomists of his generation. A spark was left in his mind, which when fed with proper stuff blazed into a dazzling fire ? Harvey, on his return to London from Padua, began to experiment on the human heart, and ultimately discovered the theory of circulation of blood.

So far people had been fed on quite contrary beliefs. Aristotle, the son of a great physican and, himself a name to remember in this sphere, had never come to such a conclusion. His disciple Galen, who had achieved the distinction of being physician to the Roman emperors Marcus Aureluis and Commdus, had explored nothing new and original. So far arteries had been considered to be the seat of spirits, but William Harvey pronounced them to be the very channels which carried blood from the heart to other parts of the body. It was a daring assertion, because it not only challenged but struck at the very root of "Prejuduce of centuries", and gave a death blow to popular belief. But like Bruno, Galileo did not believe in the views of the multitude, or "the opinion of the vulgar", or "the confirmation of the many." His faith was in the study of the admirable realm of nature. Why should one take the report

of others on trust, when one had been endowed with a faculty to reason and to find out the truth for himself ?

It is in this respect that Harvey proved a pioneer in the field of medical science. Since his discovery, physiology as a science came into its own. It became exact and scientific. Fresh air as essential to health, food as a nutritive element to the body, were all rightly understood and put on a correct foundation. so far magic, alchemy and church had played a dominant role even in the sphere of medicine. All these were now shown the way out, and medical science was hence forth rightly understood and put in its correct perspective.

It should not at all appear surprising that a few years subsequent to Harvey's death, when microscope was invented, all that Harvey had said was found to be true.

It is due to all this that Harvey stands as an outstanding figure in the domain of medical science, whose services are still remembered with a deep sense of gratitude and appreciation.

Q. 3. *"It were graceful, therefore, with this most spacious and admirable realm of nature before us, and where the reward ever exceeds the promise, did we take the reports of others on trust.........Nature herself is to be addressed, the paths she shows us are to be boldly trodden, for thus and whilst we consult our proper senses shall we penetrate at length into the heart of her mystery."* *Harvey.*

Discuss and prove how far this asserttou is applicable to Harvey's own discoveries.

Ans. Harvey was a great admirer and devotee of Naturet He once said: "Nature is a volume of which God is the author." In the above lines also, he has made a very strong plea for a direct approach to Nature, if one wants to probe her mysterious workings. It is by sitting and moving in the plenitude of Nature's own phenomena that one can best dive into her secrets. Knowledge gained solely frem books, or some thing taken for granted on the testimony of others, may not enable us to glance through the mysterious veil with which Nature covers herself. Hence, Harvey, an enthusiastic admirer of Nature, chose to study the human body in an independent manner without being biased by the views of the multitude or the opinion of his predecessors. The outcome was that the man won laurels in the field of medical science. Such is always the sweet fruit of hard and ceaseless labour.

Harvey rejected the established theories may be read from the previous question.)

The Father Of Modern Chemistry

THE IDEAS OF A. LAVOISIER

Main Points:—

(1) Mr. Antoine Laurent Lavoisier, a genius of his age, was hanged on the 8th May, 1794.

(2) He stands out not only as a discoverer of the fundamental laws of modern chemistry, but also as a great philanthropist educationist, etc.

(3) His academic career commenced as a student of Prof. Bourdelin, who was a devoted disciple of the German Professor Stahl.

(4) He achieved great renown and distinction at the age of twenty-three, and at twenty five, he was called upon to join the Academy of Sciences.

(5) Though a member of the State "Fermes", he was from the very beginning a friend of the tax-payer.

(6) He set up a model farm of his own, and evinced keen interest in the question of a balanced diet.

(7) Married Marie, the daughter of a banker. She proved a very helpful and devoted partner to her.

(8) With her assistance, he experimented in his laboratory on the nature of fire for full eleven years, and arrived at the truth that matter is indestructible.

(9) He discorered the terms "Oxygen" and "Hydrogen", and possessed great aptitude for standardisation of names.

(10) He often visited prisons and hospitals to help the poor. He worked as Head of the Treasury in an honorary capacity, but Marat turned his wrath upon him, and got him arrested and executed on the strength of certain false allegations.

Summary:—

Antoine Lavoisier was born in a wealthy family and possessed unique intelligence. From his very youth, he devoted himself to the study of chemistry. He was a student of the famous Professor Bourdelin, who daily propounded German Professor Stahl's theory of the nature of fire in the garden house of king Louis the Sixteenth. According to this object

contained fire-stuff, and when anything was burnt, the fire-stuff left its ash, and was absorbed into the air like water into a sponge.

At twenty three, he received a medal from the King for his essay on the lighting of Paris streets. He submitted schemes for bringing pure drinking water to the city, and providing water hydrants against fire. These schemes were not put into operation, but he received the honour of becoming a member of the Academy of Sciences at the age of twentyfive.

In the company of his wife Marie, the daughter of a banker, he conducted experiments on the nature of fire for full eleven years. He burned different substances under exactly similar conditions using sealed vases. After these experiments, he weighed the ashes, the vases and the air, and found them always equal to the original weight. Through these ultimately dawned upon him the theory of indestructibility of matter. No matter is ever destroyed, it only changes its chemical composition. This was his final conclusion.

In all these experiments, he used a balance for exact measurement. To him Nature appeared as a vast chemical factory, incessantly at work. Priestley had discovered a gas in the air, which when breathed produced remarkable liveliness. Lavoisier gave it its name, "Oxygen" or acid-maker, because this gas, while burning sulphur, made it leave some acid in the dish. Again, when Cavendish had discovered a gas which burned, Lavoisier found that added to oxygen, it created water, and he named it "Hydrogen" or "Water-maker". It is in this manner that he invented these two much well known terms in chemistry.

As a citizen of Paris, he played an important role in other fields also. He joined the famous company "Fermes", not in order to extort money from the poor by taxation, but in order to relieve their burden. He gave a bounteous charity to the famine-stricken people of the district where his own estate lay. He pleaded fervently for the education of children on a universal basis, and worked out a system of technical training for them. He brought home to the French peasant the idea of scientific farming. He made valuable researches on the subject of proper diet, and also originated the idea of contributory insurance in order to provide old-age pensions to the poor. As Head of the French Treasury after the French Revolution, he refused a

salary, saying he had already ample money to live on and wished to serve only in an honorary capacity.

It is shocking to know that personal grudge was made the ignoble means of cutting short the life of such a beneficent personality. Marat, a French revolutionary leader, who often dabbled in science, once submitted a paper to the Acadeny. It was rejected and quite wrongly he supposed Lavcisier to be responsible for this. Hence, at the time of the French Revolution, he charged him with heavy treason, for being a friend of the ex-king, a hated Fermier, an aristocrat, and a man of fortune. Therefore, along with all the Fermiers, a warrant of arrest was served on him also. He was urged to fly by his friends, but he did not. He only said, "I have lived a useful life, and I am ready." The scientists of the world pleaded for his life. His own wife went to Paris to save him from the jaws of death. Lavoisier himself begged for two weeks' time in order to finish his experiment on perspiration. All these were in vain. The Judge quite sternly remarked, "The Republic has no need of scholars"; and the flashing axe fell on this high-spirited fellow on the 8th May 1794, and took life out of him, This is the story of this heroic soul.

Questions with Answers

Q. 1. *How far do you consider A. Lavoisier, not only the Father of Modern chemistry, but also a citizen of the world ?*

Ans. Mr. A. Lavoisier, a wealthy citizen of France, is in the words of Mr. Horace Shipp, "a supreme exmple of a great and good man." He has earned the gratitude of posterity, not only for being the Father of modern chemistry, but also on account of his being a gentle spirit. He possessed a rare sympathetic heart, and visited prisons and hospitals, and tried to improve the lot of the wretched prisoners. He was a member of the "Fermes". an old company, which for centuries had purchased from the King the right to levy taxes, but unlike others, he never tried to extort money from the poor. On the other hand, he had a huge fund of sympathy for the poor, and once even remarked, "If it is possible to make exceptions in the levying of taxes, it can only be done in favour of the poor." Another reason, for which he liked to be a member of this organization was, that it gave him an opportunity to go all over France, and see the condition of the people for himself. Besides this, he rendered various other remarkable services to his mother-

land. In an age of stark oppression, he used his wealth and knowledge to help the poor. He was a pioneer of technical schools, a creator of model Farm which attracted visitors from all parts of the world, and the founder of a committee on Agriculture which offered to the French peasant the idea of scientific farming. He originated a scheme for old-age pension insurance.

The fact that he gave away a big sum of £ 38,000 to a famine fund in a country district, where he had an estate, speaks volumes for his philanthropic nature. It is due to these sterling qualities that the man survives to this day as a citizen of the world.

He has also been rightly hailed as "Father of Modern Chemistry." It is he who first proved the indestructibility of matter up to the hilt. He invented the terms, "Oxygen" and "Hydrogen", and according to Mr. Horace Shipp: "Not the least part of his service to scientific chemistry was his standardisation of names." He always weighed and tested and aimed at exactness. His use of balance revealed to him Nature as a vast chemical factory incessantly at work. The human body too was of this kind, making its heat by burning oxygen, changing its tissues, turning out waste ash and building afresh.

Looking to all this, one can safely conclude that very appropriately he has been called, "a great citizen of the world, the Father of modern chemistry." He not only belongs to France, where he was born and bred up, toiled and died, but belongs to mankind as a whole. Socrates is once reported to have said. "I am a citizen, not of Athens or Greece, but of the world." Lavoisier never made such a claim, and yet he is a citizen of the world. He was its ideal citizen and a devoted son, a rare combination of a scientist and philanthropist, combining in him qualities devoutly to be wished for in these taxing times.

Q. 2. *To what extent, is it correct to call A. Lavoisier, "The Father of Moderl chemistry." Explain.*

Ans. Antoine Lavoisier, a wealthy citizen and dutiful son of France. has been very rightly acclaimed by Horace Shipp, "The Father of modern chemistry". He richly deserves this tribute in view of his remarkable contribution to the science of chemistry.

Formerly, chemistry was only a sort of alchemy. The Greeks believed only in the four elements, Air, Fire, Earth, and

Water, and based all their theories on them. Medieval alchemy rejected this doctrine in its simple and elementary form, but failed to produce anything substantial. Lavoisier came with something new to impart to humanity. Taking necessary help from the discoveries of men like Priestley and Cavendish, he advanced further. His chief stress lay on weighing and testing. In all chemical experiments, he laid stress on the use of balance and exact measurement. Their absence so far in chemical experiments was a serious drawback and, therefore, Lavoisier was perfectly right in restoring exactness and accuracy in scientific investigation to an important place.

Another notewothy discovery of his, which entitles him to be called the "Father of Modern Chemistry", was his Indestructibility of matter, according to which, "Nothing is lost; nothing created" in chemical actions. For eleven years, he carefully burned different substances under exact conditions, using sealed vases, weighing the ashes, the vases and the air. He owes his great discoveries to these experiments. Sometimes he burnt tin and found that the ashes weighed more than the tin, but the air in this case weighed less. Ash and air together, however, weighed the same as the original weight before burning. In this way, he arrived at his well known generalisation of indestructibility of matter, which has been really one of the most astounding discoveries in the realm of science.

The seeds of the scientist had been laid in Lavoisier since his very student days, when he used to listen raptly to the able discourses of his teacher Bourdelin in the garden house of King Louis XVI. The Professor himself was a disciple of the German Stahl, whose theory of the nature of fire, he used to propound. Everything, according to this theory, contained what is called "phlogiston" or 'fire-stuff," and on burning, the fire-stuff left the ash and was absorbed into the air as water is absorbed by a sponge. It was he, who overthrew this phlogistic doctrine which had captured the world for over a century, and laid the foundations of modern chemistry. The tribute paid to this genius by Horace Shipp is worth reproducing: "The mistake of ages had been rectified by that brilliant mind. The manner of chemical research has been brought to something like perfection in his laboratory. He had put new instruments into our hands,

new words of exact meaning into our mouths. All chemistry goes on from the place where he established it. Lavoisier, great citizen of the world, the Father of modern chemistry."

It was really a sad day, when this champion of truth, freedom, and progress was silenced on the guillotine. He mocks at the folly of mankind from above, for "He continues to live, through genius he still serves humanity."

Religion in Revolt

JOHN WESLEY

Main points:—

(1) John Wesley caused a miraculous change in the social and religious life of the 18th century.

(2) Samuel, Charles, and John were three brothers born of a parson. The latter two initiated the Evangelical Revival.

(3) It was this movement which attacked the foibles of both rich and poor, and aimed at remedying the social evils.

(4) Even as undergraduates, John and Charles were conspicuous by their dissimilarity to others.

(5) He refused to accept his father's office and sacrificed his comfort for others; for instance, on his way to America he gave up his cabin to some one in need.

(6) His American mission was a failure due to his being too handsome and young.

(7) On returning to England, he commenced his preaching work under one Peter Bohler.

(8) In place of sermonizing in churches, he went to the people themselves.

(9) He called Christianity a social relegion and redeemed the poor from their vices.

(10) He journeyed over long distances on horseback even in face of inclement weather and in the face of mob-fury.

(11) He founded the United Society of Methodists which flourished under him and attained a full growth.

(12) He wrote and edited over four hundred books, the chief of which is his "Journal".

Summary:—

John, Samuel, and Charles Wesley were the three children of their father who held the office of a parson. John declined to step into his father's shoes when this office was offered to him. He disliked the state of the Church of those days. Clergymen cared only for their maw and little for the welfare of the people. Hence, on coming out from his college at Oxford, where he led a life different from others along with his brother Charles, he went to America as a missionary. His mission ended in failure, firstly, because of his charming personality which created a stir in the heart of the ladies and, secondly, due to his insistence on morning services at five.

It may also be noted here that Wesley as a student was an early riser, had disciplined his weaknesses and, along with his brother, had founded a "Holy club", the members of which were all serious thinkers.

After his return from America, he took to "Field Preaching" under the guidance of a deeply religious man Peter Bohler. He led this campaign for fifty years, meeting people in congregations and crossing a thousand and one miles on horse back. He insisted on personal goodness and self discipline. In the course of these journeys, he was assaulted and stoned by the mob instigated by those, whose complacency he had disturbed. He was taken to magistrates by the mob and consequently charged with causing riots. Ironically enough the mob got divided in its opinion about him, some considered him "too good" and noble, and others decried his preachings.

Not only did he preach, but wrote and edited over four hundred books, the chief of which are the "Journals", which contain a record of his journeys even in inclement weather.

To him religion did not mean an unmeaning prayer to God, but the uplift of the erring masses and their redemption from the crooked ways of life. Thus did John Wesley live up to the age of eighty-eight, devoting his entire life and energy to the service of humanity.

Q. 1. "*If ever the dreams and deeds of one man wrought a change in his generation, those of John Wesley did in the life of the eighteenth century*", *Discuss.*

Ans. Eighteenth Century witnessed a re-orientation in matters religious. It was the commanding figure of John Wesley, resolutely bent on self-sacrifice, that brought about this change. While John was a student at Oxford along with his brother, he broke with the dissolute and gay vouths of the University. He founded a "Holy club", the membership of which implied a hard and vigorous life. How John himself had regulated his life by getting up at six o'clock, five o'clock, four o'clock, can well serve as an indication of what sort of life the members of the club had to lead ! This movement began to be called "Methodism." This term was applied in derision to those students, who followed the teachings and example of John and Charles Wesley, and was later applied by John Wesley himself to his movement. The term is derived from a Greek word meaning 'rule'. Through the cult of Methodism, John Wesley brought about a far-reaching change in the social and religious life of the eighteenth century.

It is because of his exuberant energy and strong will power that Methodism became a living force in the eighteenth century. John was well aware of the corrupt condition of the clergy and their greed for wealth. Therefore, he refused to be in the shces of his father as a parson. Instead of sermonizing within the four walls of a church, he chose the life of an itinerant preacher. He joined White-field in the laudable task of "Field preaching", and every year he rode five hundred miles on horse-back, unafraid of the weather and the violent mobs, who stoned and dragged him to the magistrates at the instigation of those people, whose easeful life and complacency he had disturbed. Despite these terrible hardships, he remained devoted to his mission, carrying his message of hope, happiness and a new way of life to millions of people. Due to the rapid growth of Industrialisation, working classes were assuming new significance, and therefore, Wesley tried his utmost to save them from the evils of drink, gambling, filth and brutality, which were cankerous. He exhorted the rich also to set an example of a practical and ethical life by giving up their vicious habits.

The movement, which was founded by him as a student, was now called by him the United Society of Methodists, an Organization which grew under his paternal care, and brought about a reformation in Christianity. This movement initiated by him is also called Evangelical Revival, and it brought a

sea-change in the life of the Eighteenth century people.

Q. 2. "*Great men are meteors that consume themselves to light the earth.*" Hardy

How far the above lines are applicable to John Wesley, the pioneer of the Methodist movement ?

Ans In the lines above, Hardy has compared greatmen to meteors, which appear with a sudden flash and a blazing trail, and vanish in a moment. They consume themselves in order to illuminate this earth. Like moths sacrificing themselves on flames, great men also lay down their lives for the common weal. Their mission is to rescue the poor and suffering masses from their miserable plight. The path of greatness is thus beset with thorns, and at every step they have to encounter difficulties which try their souls. John Wesley too had to tread such a difficult path, and the motto of his life ever was, "Be our joys three parts pain".

Having declined an office of profit, he chose to lead an itinerant preacher's life. Day and night, he rode on horse-back, and on several occasions he was beaten and dragged by the masses mercilessly. Even greater than this was the super-human fortitude of this man. When he was beaten by the drink-maddened mob, blood gushed from his mouth, but he showed no symptom of pain. How even the most terrible weather failed to stop him from his journeys is borne out by an excerpt from his own journal. "So, in the name of God, we set out. The north-east wind was piercing as a sword and had driven the snow into such heaps that the main road was impassable. However, we kept on, afoot or on horse-back."

In these travels of his, he warned the working classes against their sexual immoderation, the brutality of their sports such as cockfighting, and bull-baiting. He decried their mad gambling and their apathy to the welfare of their children. In this way, he strove hard to wean them from the bad ways of living To him, reason not dogma was the basis of morality, achievement not mere emotion was the essence of religion.

Wesley never ceased to serve the poor even when warm blood gushed from his wounds. The warm blood of sympathy within was too strong to be awed by any loss of blood due to the madness of the mob. Why had he taken to serve the millions ? Because they were mad, irrational, and immoral.

Therefore, how could he forsake the path of duty. Like a meteor, he consumed himself for the sake of his suffering brethren. Suffering is more to be prized than death itself, for did not Napoleon say. "It requires more courage to suffer than to die".

Q. 3. "*Christianity is essentially a social religion; to turn it in to a solitary religion is indeed to destroy it*".
Wesley.

How far is this applicable to christianity as preached by Wesley himself?

Ans. In the lesson of "Greatness", Sir Arthur Helps has pointed out very admirably that in the Middle Ages, when Christianity became a solitary or one man's religion, it gave rise to "splendid bigots" or "censorious small people". He means to say that many gentle and well meaning Christians became very narrow-minded and turned into bigots, because caring only for their own merits and demerits, they turned away completely from any consideration of their fellow brethren.

The result was a perverted form of christianity. Christ, the Prince of Peace and the Father of christianity said, "Love thy neighbour as thyself". The Gita also preaches love for one's fellow human beings, and so do all the religions ordain. When Neitzsche condemned Christianity, he had in mind the bigotry and cruelty of Christians of the Middle Ages at a certain stage. That is, why he condemned christianity as a "great curse," "the one great instinct of revenge". But this criticism soon loses it venom, when we read what John Wesley, a true christian said.

"Do all the good you can
In all the ways you can
In all the places you can
At all the times you can
To all the people you can
As long as ever you can".

Goldsmith once said, "You can preach a better sermon with your life than with your lips." And John did exactly the same. He put the preaching of the above lines in to practice by turing an itinerant preacher. He tried to wipe out the social evils, which were rampant in those days among the rich as well as the poor. He bade the poor give

up their terrible drunkenness, mad gambling, the filth, and brutality of their lives. He asked the rich to renounce their greed, drunkenness, and exploitation of the poor. He drew the attention of the people to their lewdness, cruel sports such as cock-fightings and bull-baiting, and numberless other evils. Thus he strove for the salvation of all and sundry. A tireless wayfarer, he toiled and trudged on the highways in the service of humanity. Thus, in deed as well as in thought, John Wesley was the embodiment of a true Christian, and made Christianity truly a social religion. He established once for all that virtue is cultivated not in a cloister but in the storm and stress of life.

Q 4. *Write a short note on Methodism or Evangelical Revival.*

Ans. This movement sprang up when Charles and John Wesley were students at Oxford. It was contemptuously named "Methodism" by his fellow students, because they did not like the sober and stern sort of life, which was advocated and practised by these two brothers. They wanted to pass a jolly time in their gala days of youth. Ironically enough, the term "Methodism" was later applied by Wesley himself to the Evangelical Revival.

This movement brought about a regeneration of Christianity. Its emphasis was on "Field Preaching" instead of sermonizing to small audience within the four-walls of a Church. Thousands of people could be addressed together in the open fields and market places. The movement spread even to other countries, particulaly America. Instead of debating merely questions of theology, it vehemently attacked the social wrongs which infested the people. It attacked the rich as well as the poor for their vices. It waged a hard battle aganist slavery. It sowed the seed of reforms which spread like wild-fire in the following century.

The Rights of Man

JEAN JACQUES ROUSSEAU

Main points:—

(1) The idea of the Rights of Man, though in the air in the second half of the eighteenth century, owes its origin to Rousseau.

(2) This idea is the key note of his life and books. In this sense he was truly a modern, and also a man who always acted upon his beliefs.

(3) It is his ideas of Freedom, Equality, and Democracy, which led to the French Revolution.

(4) He was the son of a watch-maker in Geneva, and when as a convert he visited Italy, he crossed the Alps on foot, as he was a passionate lover of Nature.

(5) He hated to be called a gentleman, and possessed boundless love for the common man.

(6) Part of his life was spent as a vagabond, which was in some ways ignoble, but he made an outright admission of it in his "Confessions".

(7) He wrote two famous books "Contract Social" and "Emile". In the former he attacked unnecessary restrictions imposed by the government and, in the latter, criticized the church dogmas.

(8) His "Emile" offended the Church, and Rousseau had to fly from Paris, where he retured in 1770 after several years' voluntary exile.

(9) He died eleven years before the French Revolution, but his ideas spread to America, and created a passion for freedom in France and across Europe.

Summary:—

Jean Jacques Rousseau, son of a watch maker in Geneva, had little education. He was apprenticed to an engraver in Geneva, but played a truant. He became a convert to the Roman Catholic church, and was sent to Italy by Madame de Warens. He loved wild Nature which was hated in those days, and crossed the Alps on foot. He always liked to travel on foot, and had no liking for playing the gentleman and taking a carriage. His love of Nature was almost a controlling passion with him. Later, he wanted to go on a walking tour, but could not, for want of finding a companion. In the matter of "hiking", he was a pioneer and before the times.

Some part of his life was spent as a vagabond which was in some measure mean and shameful too, but Rousseau had blandly admitted it in his 'Confessions". For some time, he worked as an assistant to a charlatan, then taught music

and copied music, treated quite badly Madame Warens, had an amour with a girl and, at thirty eight, wrote a novel "Julia", which was an immediate success.

Afterwards, he published two more books. The first was "Contract Social", in which he stressed the importance of the common man, and affirmed that he was invariably good at heart. There was no need to teach him right and wrong. Left free, he would govern his own affairs well. And therefore, there should be as little of governmental machinery and as few laws as possible.

In his second book "Emile", Rousseau advocated a new type of education. He attacked the church dogmas though he had belief in the existence of God. For six years, he was without a home and refuge. At last, he reached England, but there too he fell out with Hume, his host. Some of his admirers considered him insane. At last in 1770, poor and forlorn, he returned to Paris. For eight more years he lived, making his both ends meet, by copying music. In the last years of his life, he languished in poverty and then fell in to a sleep that knows no breaking, just eleven years prior to the French Revolution.

The idea of "The Rights of Man" comprising Freedom, Equality, and Democracy is the keynote of his life and books. These ideas were then in the air but the credit of giving them a shape and power goes to Rousseau.

Out of his books and writings came the ideas of the French Revolution; a new ideal in education; romantic novel with its passion for Nature, and a new kind of autobiography. He was truly a modern. He believed in the Rights of Man at a time when no body else did, and always acted upon those beliefs.

The French Revolution was the inevitable out come of his ideas. These ideas created stirrings in America, England, and Europe, and awakened the people from their age-old slumber to a sense of right and dignity hither to unthought and undreamt of.

Questions with Answers

Q. 1. *"The most dynamic idea in the world today is the belief which Jean Jacques Rousseau put in to his life and books, the idea of the Rights of Man." Elucidate.*

or

"Like a stone dropped in a pool the waves of that idea have spread. To day the whole world is overwhelmed by them." Explain with reference to Rousseau's idea of the Rights of Man.

Ans. It was Jean Jacques Rousseau, who in the second half of the eighteenth century, propounded the idea of the "Rights of Man," comprising Freedom, Equality, and Fraternity. These three have become the watch-words of human civilisation and progress since then. The French Revolution itself was born of these ideas. Wars have been fought to preserve these three fundamental rights of man. The Declaration of Human Rights by United Nations Assembly assigns a very important place to these three rights.

Everywhere, whether it be the Occident or the Orient, there is a widespread demand for safeguarding these fundamental Rights of Man at all costs. People are prepared even to shed their blood, the moment these ideas are at stake. The constitutions of all the free countries of the world are drawn up on the basis of these fundamental Rights, and guarantee these to each and every citizen of their country without any distinction of caste, colour, creed, and sex. Who was the father of this human freedom ? Jean Jacques Rousseau, the son of a watch-maker of Geneva. The Declaration of Independence made by America in 1783, is just a repetition of Rousseau's vindication of human rights.

The liberalism of the nineteenth century and various other isms owe their origin to the basic conception of the Rights of Man, which is at the root of these all. This is the unity in their diversity, oneness in their multiplicity.

Rousseau expounded these ideas in his two epoch-making books, namely, "Contract Social" and "Emile". In the former which heralded an era of revolution, he showed the iniquity of the rich who sought to govern the poor under the pretence of pointing them the right way. Under this sinister veil, they extorted money from the poor in the form of heavy taxes. Rousseau asserted that the common man was essentially good at heart. It is the common man who should control and benefit by the government. Man should be left to himself. There should be as little of governmental check and as few laws as possible, so as to allow every person to grow

up naturally and act in the right manner. There was no necessity for authority and law. These had a cramping effect, and only vitiated the people.

In his second book "Emile", he advocated a new system of education in place of the old one. Rousseau believed in God but cast aspersions on the church dogmas. For this he was persecuted and made to flee for life from Paris. This has been the fate of all innovators and Roussseau was no exception.

For the first time, Rousseau idolised the common man in his writings. It was an epoch-making declaration in history when he said, "It is the common people who make up the human race. What is not the common people is hardly worth considering".

The same idea was echoed by Goldsmith in his memorable lines.

"But bold peasantry, their country's pride
When once destroyed can never be supplied."

Wordsworth too eulogized and upheld the dignity of the common man, who lived in the lap of Nature, away from the tainted life of the cities.

Therefore, to Rousseau we stand deeply indebted for his revolutionary idea of the "Rights of Man," Which gave a death-blow to the might of the privileged classes, e. g., kings, emperors, princes, priests, and aristocrats, and put the common man on a high pedestal. These Rights of Man have penetrated into every nook and corner of the world, into every hearth and home. They are as true and powerful today as the day when born.

Q. 2. *"It is the common people who make up the human race. What is not the common people is hardly worth considering." Rousscan.*

How far does this hold good of Rousseau's doctrines.

(Please see the relevant portions of the previous question.)

Q 3. *"This Jean Jacques Rousseau was truly a modern."*

(Horace Shipp).

Prove the truth of the above statement with apt illustrations.

Ans. This Jean Jacques Rousseau, born in the second half of the Eight-eenth century, is essentially a modern in

ideas, by virtue of which he is alive and powerful even today. Great men perpetuate themselves through their ideas, as has been well said:—

> The lives of great men all remind us,
> We can make our lives sublime,
> And departing leave behind us
> Foot prints in the sands of time.

Plato, Aristotle, Socrates, and many other philosophers, writers, and statesmen are all living even to day because of their ideas. It is ideas and ideals and not men which have the power to move the world. Wendell Philipps has also repeated the same truth in a different manner, for says he: "It is only liquid currents of thought that move men and the world." So does Rousseau live even today, and will continue to live in the years to come as long as humanity chooses to respect and safeguard the fundamental Rights of Man. For example, Rousseau's regard for the common man is echoed in the following words of the Father of our Nation: "To slight a single human being is to slight divine powers, and thus to harm not only that being but with him the whole world."

Rousseau is a modern by virtue of other ideas also which are scattered like gems throughout the pages of his books. Did he not say, "In the state of Nature, equality is a real and inviolable fact." The same equality is now the cry of every civilized government. In his book "Emile", he has presented to us a new ideal of education, which a century later, blossomed into the works of Froeble and Madame Montessori and other advocates of free expression and free discipline. Out of another of his books sprang the conception of the Romantic novel with its passion for Nature. Through his travels across the Alps, Rousseau anticipated the modern movement of "hiking." Similarly, from one of his other books originated a new kind of autobiography, which set an example for a candid confession of one's actions even if they were "shameful and unflattering."

It is due to these ideas which Rousseau has left behind, and which agitate the minds of the people in the present times, that Rousseau is in the true sense of the word every inch a modern. Did not Sir Livingstone observe in his book, "Some Tasks For Education", "Modernity is not a question of date but of out look." It is Rousseau's outlook that makes him a modern.

Q. 4. "*In the state of Nature equality is a real and inviolable fact.*" *Rousseau.*

Prove the truth of the above statement.

Ans. Rousseau pleaded for equality among men on the basis of equality which his discerning eyes saw in the state of Nature; Rousseau was a passionate lover and admirer of Nature; in her he saw many ideas and ideals, which he wanted mankind to learn from her. One of such ideas is the establishment of equality in human society. He desired the distinction of the rich and the poor, the ruler and the ruled to be done away with, as it served no useful purpose. Man should be left to himself and he would prove the best judge of his own interests. The powerful people simply usurped the rights of the weak and exploited them for their own ends. This was a baneful use of the intelligence and wisdom with which mankind had been endowed. Therefore, he wanted humanity to follow Nature and establish equality on an inviolable basis, so as to establish the foundation of a true welf are state where all will be happy and prosperous.

The Rights of Women

MARY WOOLSTONECRAFT

Main Points.

(1) A plea for the rights of women was first put forth by Mary Wollstonecraft in her book in the year 1792.

(2) There had been some great and powerful women even before Mary, but none of them ever put forth any claim for the rights of women.

(3) Even Rousseau in his book, "The Social Contract" had excluded women from his claim of universal Rights for Man. He considered women's job simply to make themselves pleasing to men.

(4) Mary's own life-sketch may be found in brief in his novel "Mary".

(5) Mary always came to the rescue of distressed women, and proved of particular help to her sister and also to her friend Fanny.

(6) Her momentous book, "A Vindication of the Rights of Woman", led to big movements for rights of women in almost each and every country.

(7) Their demand to enter the professions was also accepted, though after an uphill and long struggle.

(8) Women have proved the justice of their claim by their own achievements.

Summary:—

Mary Wollstonecraft has narrated her life story in brief in her novel "Mary". From that we come to know that her sympathy was instinctively drawn towards women, who were being subjected to oppression and persecution. She remained awake outside her father's room in order to come to her mother's rescue, as she apprehended some harm to her from her father; she helped her own sister Eliza and a friend Fanny; the latter even at the cost of her fortune. All these charitable deeds deserve their meed of praise from us. When she was away from London to help her friend Fanny, the school which she was running with Eliza's assistance failed, and she had to take recourse to Journalism in order to eke her livelihood. It proved a blessing in disguise, because being in the clutches of poverty, she took to writing and produced her first book, "Thoughts on the Education of Daughters", and a few years later wrote her famous book, "A Vindication of the Rights of Woman", which has become an ineffaceable landmark in the history of the struggle for emancipation of women. There had been quite influential ladies even before her, but they all had shirked to undertake the burden of forcing the recognition, and securing the protection of the Rights of Women. It was she who threw down the gauntlet against the age old slavery of women. She had very little to strengthen her hands, because even Rousseau, the champion of common man, had not espoused the cause of down-trodden women. It was only Defoe, who in his "Robinson Crusoe" had a few words to say in favour of the rights of women.

Mary in her book "A Vindication of the Rights of Woman" went down to the root of things, and established women's equality with men in all spheres, economic, social, and political.

Her book inspired all those who came after her, though the fruit appeared a bit late. After an unbroken spell of

fifty years, 'nne knight in 1847 demanded rights for women. In 1869, Mill introduced a Bill in Parliament seeking to establish the rights of wcmen. In 1907 Finland gave votes to her women, and Norway followed suit. England granted them their due rights after the "Suffragists" had fought fcr them and won.

The women were given admission to colleges and universities. The first college was established in 1858, called Cheltenham Ladies' College and, later on, London, Oxford, and Cambridge also began to admit women candidates.

Then there was a demand from women to enter certain professions. The first of its kind to be made was by Miss Jex-Blake, who wanted to enter the medical profession. It was only twenty years later that a woman could have this right. The subsequent growth of this movement was however smooth and easy. No difficulties were confronted. Women were admitted to all professions, law, politics, commerce, engineering, and what not. Then a final death blow to the reactionary element was dealt by Ibsen and Shaw, who have been stout champions of the rights of women. But the beginning in this direction and a very effective one was really made by Mary. She was the first to break the ice. She is therefore the first and foremost emancipator of the weaker sex.

Questions with Answers.

Q. 1. *Show, it was none else but Mary Woolstonecraft who originated the idea of the Rights of Woman, and made it a real, living thing.*

Ans. Many ladies, some by virtue of their beauty, others by dint of their intellectual power, had achieved eminence and distinction even before Mary Wollstonecraft. For example, Sappho, the poetess of Greece, Vittoria Collona, whom Michael Angelo deeply loved, Madame Roland of Revolutionary France, whose salon was always crowded with political workers, had been her renowned predecessors. But none of them had even pleaded for the rights of women, or had raised any note of protest against their exploitation and suppression by men. Even a staunch champion of human rights like Mr. Rousseau had ignored the claims of women

in his book "The Social Contract" published only thirty years before Mary's book.

Mary, a young woman of only thirty, angelic in her thoughts and deeds, took upon her shoulders the burden of uplifting women. Charity begins at home, so goes the saying, and Mary commenced her work of amelioration among her own kinsmen. She lay for the whole night outside her parents' chamber, ready to rescue her mother, if she was struck by her father. She delivered Eliza from the clutches of her husband Bishop, who proved very violent to her. She went to Lisbon to help her friend Fanny, when she was on her death-bed. On returning to England, she found her school in a ruined state and, therefore, she started to make a living with her pen. "Thoughts on the Education of her Daughters" was the first fruit of her literary labour. After years of journalism and authorship came her revolutionary book, "A Vindication of the Rights of Woman," in which she took up cudgels on hehalf of women. She stressed that woman instead of merely being useful or pleasing to men, as Rousseau said, had a definite role to play in society and possessed equal political, economic, and social rights with men, and was in no case to be treated as a chattel. This was indeed a very daring assertion, as for the last sixty thousand years of human life on earth, women had occupied only a subordinate place to men.

Mary alone with her single book created a ferment in the existing social structure and, though it took time, gradually and gradually were then audible the voices of the champions of women. It was fifty years after Mary's publication of this book that a pamphlet was published by Anne knight demanding rights for women. Nearly eighty years later, John Stuart Mill introduced a Bill in the Parliament for the establishment of the rights of women. To quote Horace Shipp:-- "These things were the tide-marks of the flood which crept up throughout the nineteenth and the early twentieth centuries." And thus, under Mary's inspiration and guidance, the movement for the emancipation of women grew steadily from strength to strength. It was she who prepared the ground for such bold assertion as came later from the ps of W. Lloyd Garrison; "Wherever there is a human I see God-given rights inherent in that being, whatver may be the sex or complexion."

Q. 2. *What place does Mary's book "A Vindication of the Rights of Woman" hold in the struggle for emancipation of women. Explain with illustrations.*

or

Trace the growth of the movement for securing the Rights of women.

Ans. Before the publication of Mary's book "A Vindication of the Rights of Woman," none either in thought or deed, had put forth any claim for the Rights of Women. There had been very influential ladies no doubt, who commanded awe and reverence either by their beauty or intellect, but they had never troubled themselves with any thought of their kind (women). It was Mary, who with her book introduced a new era in the social status of the fair sex. It was after the publication of her book that other heroes and heroines sprang up, who made dear to their hearts, the cause of the suffering and toiling women. So far people considered women's role as subordinate to men. For example, Rousseau, a great revolutionary of his age, had thus poorly opined for women:—

"The education of women should always be relative to men, to please, to be useful, to make us love and esteem them, to educate us when young, and to take care of us when grown up."

For more than sixty thousand years of human life on the earth, women had been kept under subjugation by men. Her work was only to keep the house, and if she became a wage-earner, she was paid invariably less than man. She had no property rights even after marriage until 1882. Hence, the publication of Mary's book in 1792 came as a "bombshell in to the world of thought." There was a wave of amazement and horror.

It took another half century for this movement to grow to some rocognizable dimensions. Anne knight in 1847, and John Stuart Mill in 1869 demanded rights for women. In 1907, Finland granted votes to her women. Norway followed suit. But in England, "Where Freedom broadens down from precedent to precedent," it took still more time for women to get their legitimate rights.

This struggle then entered the field of education and, there too, after an uphill and protracted fight, claims of women for education gained recognition. In 1858, Cheltenham's Ladies' College was established, and in 19⁄25 after a very long and bitter struggle, Oxford and a very reluctant Cambridge granted degrees to women, though London, and other provincial universities had granted degrees to women even earlier.

Then women put forth a claim to enter various professions. In 1869 when Miss Jex Blake demanded a medical degree and the right to practice as a Doctor, it shocked the sensibilities of the people. It was only after twenty years that another woman was granted a medical degree. But then came women like Florence Nightingale who, by their deeds, established the supremacy of women. It took hundred and fifty years for women, since the publication of Mary's book, to get equal rights with men in all fields including social, commercial, and political. Great names have followed hers, and even our men of letters like Ibsen and Shaw embraced the cause of women. In the Doll's House, Ibsen has presented to us, the story of a wife who was treated as a doll, and had then ultimately to revolt, and leave her husband to live in her own way.

Thus it is that Mary's book stands as the first thing of its own kind. "Another race hath been, and other palms are won", but the most glorious palm goes to Mary Woolstonecraft and her book.

Tragedy at Tolpuddle

THE IDEA OF TRADES UNIONISM

(1) A sentence of seven year's transportation was passed on six farmers, and they were to bo sent to Botany Bay.

(2) This sentence was passed for organizing a Grand Lodge at Tolpuddle, and for binding themselves together with secret oaths.

(3) The earlier phases of the workers' struggle include Mediaeval Guilds and the Act of "The statue of Apprentices."

(4) With the setting up of factories and industrial centres, the problem of unemployment became very acute.

(5) Workers were forbidden to unite by "The Combination Act", as workers had begun to go on strikes.

(6) "The Combination Act" was repealed in 1825.

(7) The six farmers were sentenced in 1834, but were pardoned later due to the agitation of the workers.

(8) As this incident took place at Tolpuddle, it is known as the tragedy of "Tolpuddle Martyrs."

Summary:—

The idea of the union of workers can be traced back to the Middle Ages, when Mediaeval Guilds were in existence. These were followed by an Act in Queen Elizabeth's time called, "The Statue of Apprentices", which approximately made these Guild arrangements legal. For two centuries this simple method worked quite successfully.

In the eighteenth century, with the advent of machinery, industrial towns crammed with factories sprang up, and land also was formed in to big units, discarding the old system of individual ownership. Due to all this, there arose the problem of unemployment, and the workers felt the need to unite and strike work. This caused a terror in the hearts of the employers who were mostly rich. They had already witnessed the bloodshed of the French Revolution and horrors of mobocracy. Hence in 1799, at the instance of millwrights, an Act was passed by Parliament forbidding combinations of workmen. Sheridan tried to mitigate the hardship caused by this, but he could not go very far. Judges and Magistrates continued to remain prejudiced against workers and sentenced them to rigorous imprisonment or transportation or death. The workers struggled on, and as strict watch was kept on them by the forces of law and order, they turned it in to a secret affair with mysterions rituals. Due to the arduous efforts of three persons, William Cobbett, Francis Place and Joseph Hume, in 1825, The Combination Act was repealed. The gentry, the aristocracy, and the employers were still afraid of the workers, and when the Grand Lodge at Tolpuddle came in to existence, they sought the help of one Lord Melbourne, who pointed out to them the existence of an Act of Parliament passed a few years before to put down a naval mutiny, declaring union on secret oaths as illegal. It was for administering secret and illegal oaths on the formation of this association, that the workers were

sentenced to transportation at Botany Bay, where the conditions were very terrible. Their spirit of martyrdom produce more martyrs, and after two years of agitation, they were pardoned. It took two more years for them to regain their old liberty.

Questions with Answers.

Q. 1. *Trace the growth of the idea of Trades Union and the place of Tragedy at Tolpuddle in it.*

Ans. The faint beginnings of Trade Unionism can be traced back to the Mediaeval times, when associations like "Mediaeval Guilds" used to exist. Under their auspices, craftsmen, masters and apprentices settled wages and conditions of work in their own trades. In Queen Elizabeth's time, a piece of legislation called "The Statue of Apprentices" followed, which gave legal sanction to these Guilds.

For full two hundred years these associations were allowed to function. The last years of the Eighteenth century witnessed the advent of machine, followed later by steam, which brought in to being factories instead of individual workshops. These further brought in their wake big industrial towns in place of small villages and bigger farms in place of small holdings.

It was at this time that some workers in the woollen trade in the west of England grew apprehensive at the way things were going for them, and requested the government to revive the old Act of Elizabeth. This demand was opposed by the woolmasters and, therefore, the government paid no heed to the request of the workers. Adam Smith in his book "The Wealth of Nations" advanced the theory of "Enlightened Selfishness", which proposed that if every individual worked to earn wealth for himself without any interference, every individual in England will become prosperous. It was in a way the doctrine of "Laissez Faire'. But this sort of theory could not meet the problem of unemployment and low wages of the workers, who were living at starvation level. It could work only for the benefit of the rich.

Workers when thus oppressed, gave vent to their indignation by damaging machines. Later they started jointly to strike work and also on some occasions prevented others from doing their work during the period of strike. This sometimes resulted in riots. The mad fury of the mob had already once shown itself in a very terrible form during the French Rovolution.

Therefore, the owners and the employers grew tyrannical through fear.

In 1799, as a result of agitation by millwrights, the government passed a "Combination Act", forbidding the formation of the Unions of workmen. Even men like Wilberforce, who once fought for the freedom of Negro slaves, supported such reactionary moves. It was at the instance of Sheridan that the rigour of this law was lessened. The new Act yet remained a dead letter and, sentences on workmen were freely passed by Judges and magistrates who sided with the employers. It was in such an atmosphere that the idea of the Trade Unions grew, and due to the fear of the Law it became naturally a secret affair, admitting new members on oaths, with such accompaniments as drawn swords, battle axes, and skeletons.

The idea of Trade Unions was by now firmly rooted. William Cobbett in his paper "The Political Register", reported about the miserable conditions of the poor. Due to the efforts of Francis Place and his friend Joseph Hume, the former a breeches maker, and the latter a Member of Parliament, the "Combination Act" was repealed in 1825: And then came the climax in 1834, when at Dorchester, six farm labourers were sentenced to seven year's transportation on the charge of "administering an unlawful oath". Their martyrdom roused the entire country. Workers rose in protest, and ultimately these six men known as "Tolpuddle Martyrs" were pardoned. It was the triumph of the idea of Trade Unionism against the exploitation by the rich. The scales of justice were thus tipped in favour of the martyrs, and a majestic gateway with an inscription was erected in their honour.

Q. 2. *Write a short note on "The Tolpuddle Martyrs."*

Ans. In 1825, the "Combination Act" was repealed through the unremitting efforts of Francis Place and Joseph Hume. Inspite of this, in 1834 six farmers of Dorchester were sentenced to seven years' transportation for life, and were transported to Botany Bay. This was virtually a death sentence, because few people survived after serving their term of exile due to flogging, underfeeding and other abominable conditions prevailing there. Moreover, there was no arrangement for the return of these criminals. Hence, they either died or turned brigands.

These six farmers were punished on the charge of "administering an unlawful oath." Only a few years before an Act had been passed in the Parliament of England, forbidding people to bind themselves together with secret oaths. On the formation of a Grand Lodge at Tolpuddle by these workers, the local farmers, the Squire and the Lord Lieutenant of the country requested Lord Melbourne to nip the movement in the bud. And therefore, the wearing of masks and swearing on the Bible, a six-feet-high painted skeleton and wooden battle axes were considered to be unlawful formalities. It was on the basis of this secret oath-taking that they were charged, tried, and sentenced to transportation.

These six men had not organized the Grand Lodge for the sake of building up an institution, but had done so to escape starvation, and demanded ten shillings a week as their wages instead of the seven which they were getting, because the cost of living had risen high.

These men possessed hearts of steel, and were determined to pursue their goal. Thus sang George Lovelace:—

"We raise the watchword 'Liberty'.

We will, we will, we will be free."

Their boldness and spirit of martyrdom roused all the workers. Robert Owen led a multitude to the Parliament to voice their protest. After two years of agitation, these people were granted pardon, and it took two more years to set them free. The idea of Trade Unionism emerged triumphant, and defeated the plans of the rich who used to buy their pleasures with the tears of the poor. "All wealth is the product of the labour," said Locke, and henceforth labour came in to its own, and could receive its due share of profit from its masters.

Evolution Explains

THE IDEAS OF DARWIN, WALLACE, HUXLEY.

Main Points:--

(1) The idea of evolution can be dated back to very old times.

(2) Until 1860, in England as well as on the Continent, the idea of evolution was bitterly denounced by the Church.

(3) Darwin was already making investigations about this theory of evolution.

(4) He went on a long voyage on the ship H. M. S. Eagle, and pursued his subject of study with great zest.

(5) He published his book "The origin ot Species", which embodied the theory of Evolution, in 1859.

(6) Darwin was very generous in accepting the views of others also, if they supported his own. He accepted wallace's view and incorporated it in his own.

(7) "The Descent of Man" was the next book published by Darwin. It further disproved the theory of the Divine Origin of man and this world.

(c) In the beginning, this theory met with some opposition, but later on it was accepted by all, including churchmen, scientists, and philosophers.

(9) Strangest of all, out of it came knowledge which has disproved Darwin's original theory. It remains therefore a milestone on the road of knowledge, which has been already passed by us.

Summary:—

The idea of evolution had existed for several centuries even before Darwin, though only in a vague form. Greeks had formed some dim ideas abcut it. Goethe believed in it, and so also Darwin's own grandfather. The French zoologist Lamarck also published a book on it in 1809.

This idea had to face bitter opposition from the orthodox Church, which had pinned its faith on the Theory of Creation as presented in the Genesis. The Universities of Oxford and Cambridge did not admit any dissenter to their colleges nor did they permit scientific studies, lest they should give rise to an attitude of scepticism towards the established Christian faith. On the Continent also, the same sort of opposition to the idea of evolution prevailed. Haeckel in Germany fought a hard battle against the orthodox Church as Darwin, Wallace, and Huxley did in England. Even in the year 1877, the Prussian Minister of Education forbade the teaching of the principle of evolution in schools. In

1860's, the evolutionary theory was a topic of heated controversy. In 1859, came Darwin's epoch-making book "The Origin of Species", which caused a furore among the people. It was a thrilling work, giving a rude shaking to the established faith and views of centuries. Darwin had arrived at it after a laborious study of nearly three decades, during which period, he in his house at Downe toiled day in and day out. Darwin's success was chiefly due to his love of science, infinite patience in reflecting upon any subject, considerable industry in observation, and collection of facts. He gave up his most favourite hypothesis as soon as facts contrary to it were brought to his notice. With a searching mind, he undertook the task of solving the riddle of fossils and variation in species. How he spent a long period on the ship H.M.S. Eagle absorbed in study and research is well-known. Ultimately, he arrived at his theory of evolution, which made his name ring with fame.

He was quick to admit any other view which was similar to his own, such was his open-mindedness. When he was giving finishing touches to the "Origin of Species", he received a criticism of his own theory from Alfred Russel Wallace, a man younger than himself. In that, he saw himself forestalled. To him we owe the oft-repeated phrase, "the struggle for existence." Darwin at once conceded the merit of his criticism, and included the name of Wallace as his associate in the paper, which was read before the Linnean Society in 1858.

Another book was published after a period of twelve years, called "The Descent of Man." Man was like other animals of this creation and "lower than the angels by several more degrees than he had been led to suppose." This again administered a rude shock to the theory of the Divine source of this Creation. This was the second stage of development in Darwin's theory. The doctrine of evolution did not cause any substantial offence to the theory of deism, but the principle of natural selection is definitely mechanistic. It involved a mechanistic conception of human progress, which is for many people, a sort of irreligious assertion.

Darwin now became a depraved fellow in the eyes of the orthodox people, a fact which distressed him to the core. He was averse to discussion and left it to Thomas Huxley

to battle with the bishops, himself leading a quiet life at Downe. He called Huxley a "bull-dog", who growled and barked at the opponents. It was he, who in a heated controversy with Bishop Wilberforce of Oxford, retorted to his scurrilous remarks by saying that he would like to be related to "apes" rather than to the bishops.

Questions with Answers

Q. 1. *Describe the influence exercised by Darwin's Theory of Evolution on the subsequent scientific thought.*

Ans. In the beginning Darwin's theory was harshly ridiculed by orthodox people, but gradually and gradually people accepted it. Scientists, philosophers, and thinkers of all kinds gave credence to it. Out of it emerged new branches of science, sociology, anthropology, and modern psychology. The unifying principle of a common origin had a beneficial effect on the science of biology, and it resulted in immense activity and productiveness. Geology, physics and chemistry, all benefited from this. Since then, psychology has broadened its sphere, and in place of merely dealing with mental disorders, it has probed the deep recesses of human mind. The study of history took on a new aspect. The study of languages became a science and, in addition to all this, the theory exercised tremendous influence on modern philosophy.

The theory is not retrogressive as thought by many; on the contrary, it holds out bright hopes for the future of humanity. If man has evolved to this degree of perfection from the wild life of the apes, he can one day really prove himself equal to angels and share the nature of God Himself to the full.

No doubt, people have begun to draw rather absurd inferences from Darwin's theory, e. g, its advocacy of war, its justification of the oppression of the poor by the rich. This is only an instance of the moral and mental perversity which clouds our vision almost in all spheres of life.

Q. 2. *Point out the various stages in the growth of the Theory of Evolution, and also the contributions made by Darwin, Wallace, and Huxley.*

Ans. See the summary of the lesson.

Q. 3. *"Thus from the war of Nature, from famine and death, the most exalted object which we are capable of conceiving namely, the production of the higher animals, directly follows. There is grandeur in this view of life, with its several powers having been orginally breathed by the Creator in to a few forms."*

(Darwin)

Fxplain the above.

These words form the closing lines of Darwin's book "The Origin of Species" in which he expounded his evolutionary theory. The idea of evolution did not flash upon Darwin's mind all of a sudden, but was the fruit of a vigorous mental pursuit of a theme carried on for years together. He went on a voyage as a Naturalist to the Pacific on the Government Researchship H. M. S. Eagle in 1831. Since then he started collecting facts about Botany, Zoology and Geoglogy to discover the truth about evolution. During the course of the voyage, he read two very important books, Milton's 'Paradise Lost' and Charles Lyell's "Principles of Geology." The latter book did not accept the established beliefs about the age of the earth, and was one of the earliest to point out the significance of the fossils. After the voyage Darwin settled down at his house in Downe, and continued his research unabated.

In 1844, he reached a vital conclusion embodied in the assertion, "I am almost convinced that species are not immutable. It is like confessing a murder." By now, Darwin was firmly grounded in the belief that animals, birds, and plants did gradually change. But why a mocking thrush on a particular island was different from the similar species on another island ? He found a clue to this riddle in Malthus' book called "Population." Long since Darwin had been convinced of the struggle for existence, and it at once struck him, "that under these circumstances favourable variations would tend to be preserved, and unfavourable ones to be destroyed. The result would be the formation of a new species." The secret of evolution was, in other words, that some species with certain characteristics, which ensured them food and protection survived. Their offsprings too inherited some of their characteristics, and they too could survive, and became the type. It was in this way that the principle of

evolution had worked both in the field of animal as well as human life.

According to this theory of evolution, it was now definitely established that there was a constant warfare going on among the species for their preservation or survival. Some had become extinct and others had survived. Those who survived could do so only by adapting themselves to changed conditions or environment. It is through this struggle for existence that higher and higher forms of life manifested themselves, and variations in the species took place.

This view discarded the theory of Creation as given in the Bible, which said that the entire Creation was the handiwork of God and completed within six days. In place of this, the view now advanced was that this creation has been a slow and gradually evolving phenomenon continuing for thousands of years in the past and further open to such other changes as might ensue. The Creator had just created a few forms of life, and they had gradually evolved and preserved themselves, according to Darwin's Theory of Evolution. This theory stressed man's power of being capable of higher and higher transformation, a dynamic force working within him, and achieving its ends through a slow, evolving process.

Q. 4. "*We have not the slightest objection to believing anything, if you will give us good grounds for belief, but, if you cannot, we must respectfully refuse. No good ever comes of falsehood.*"

(Wallace)

Explain how does the above remark refer to the theory of Creation as mentioned in The Bible?

Ans. The Bible has ascribed this creation to God, and has called it a fine specimen of his handiwork completed within a course of six days. The Church literally interpreted the text of the Bible, and ascribed all types of animal and plant life to God, the Almighty. The Book of Genesis thus explains the process of creation. And God said, "let the earth bring forth the living creature after his kind, cattle, and creeping thing, and beast of the earth after his kind." And further God said, "Let us make man in our image after our likeness, etc." The Universities of Oxford and

Cambridge, the two great seats of learning, upheld the Biblical theory of Creation as they were completely dominated by the orthodox Church. They also made no provision for science and did not admit any dissenter, simply as a precautionary measure. Thus, with all their might and main, they sought to guard the Biblical theory. Similar conditions prevailed in other Universities on the Continent also.

The theory of Creation as expounded in the Bible failed to account for the mutability and extinction of species, the process of gradual modification, and the resemblances and differences of structure in various groups of plants and animals. The problem of the fossils of extinct animals in the rocks could not also be explained. Some said they were the remains of species of animals which had been specially created on the fifth day. Finally, somebody suggested that God had embedded those fossils in to the rocks to test the faith of the nineteenth century people. These mysterious explanations failed to satisly the people. They were not only conflicting and unsatisfactory, but were just a sort of trick played by the orthodox people to silence the doubts of the dissenters and keep the old Christian faith in tact. Darwin and Wallace questioned the authenticity and feasibility of the Biblical theory. There were no good grounds of belief; and there was no good in accepting falsehood which must be exposed some day or the other. On the other hand, the Darwinian theory as supplemented by Wallace succeeded in giving a very reasonable account of the changes which have taken place in the universe since its creation. There was no good in insisting on the Biblical theory, if it failed to explain scientifically the phenomenon of mutability of species and the extinction of others. William Drummond too held the same view. He said very emphatically, "He who will not reason, is a bigot, he who can not is a fool, and he who dares not is a slave." Therefore, Wallace was very much justified when he pleaded for the rejection of the Biblical theory as it could not advance good grounds of belief in its support. He was not prejudiced against the Biblical theory, but he simply disliked blind adherence to theories and ideas, which could not resolve the questionings of man's mind, though they might have been drawn from the holiest of books called The Bible.

Mankind Versus Microbe

THE IDEA OF PASTEUR AND KOCH.

Main Points:—

(1) An Italian physician wrote an Arcadian poem as well as a book in the sixteenth century, in which he ascribed diseases to "seeds", which spread from one body to another.

(2) No body paid any attention to his observations.

(3) After more than a century, an English and a German doctor again found some proofs of the living, infectious particles as the causes of diseases, but as yet none took any serious note of it.

(4) Pasteur, born in 1822, worked successfully on the causes of the fermentation of wine and the diseases of silk worms.

(5) He found the causes of both of them in germs, which spread quickly under favourable conditions.

(6) Similar researches were being carried on on the Continent also by Lister, Koch, and others.

Summary:—

In the early sixteenth century, an Italian physician expressed the idea of the "seeds" of diseases as being conveyed from one body to another in an Arcadian poem, which received very scanty notice. Even his next book "Treatise on contagion," embodying the same idea in a different language went unheeded.

For well over a century, none ever thought of the problem of diseases in the light of the above discovery. An English doctor again took up the idea of "infectious particles" as the cause of diseases, and a German too found "living" particles in the blood of a patient. But no further progress in this direction was made for another hundred and eighty years.

Then came Pasteur, who was born in 1822. After finishing his studies of crystals, he tackled the problem of fermentation of wine and won the battle successfully. This opportunity came when he was working as a Professor in the heart of a wine country, and a wine merchant, the

father of one of his pupils, asked his help in order to save his huge stocks of wine from getting sour (smell suggestive of fermentation).

Thereafter, he turned to silk-worms, and after a vigorous and unabated search, saved the silk industry which was suffering ruin on account of a disease of the worms.

Work on exactly similar lines was being conducted by other scientists in other countries also. Joseph von Pettenkofer was waging a battle against cholera in Munich. Lister was carrying on his fight against septics at Glasgow, deriving his inspiration mainly from Pasteur's discovery of the cause of fermentation. Koch, a German scientist was fighting the disease called anthrax (splenic fever of sheep and cattle) from which he was able to detect different germs of different diseases. Pasteur was doing the same thing in France, and he succeeded in bringing down the rate of mortality very low.

Then came the last smashing victory over Hydrophobia, an achievement which has sent ringing Pasteur's name and fame to every nook and corner of the world.

No doubt Pasteur had to face lot of ridicule from chemists and doctors, whose methods of treatment and ways of thinking he challenged, but undeterred and undaunted, he pursued his noble task without caring in the least even for his personal griefs which would have crushed an ordinary soul.

Questions with Answers.

Q. 1. *Describe the achievements of Pasteur in his fight against the microbe. What measure of success did he achive in this task ?*

Ans. The fermetantion or souring of wine stocks had not only taxed the minds of chemists, but was causing enormous loss to the trade of the country. After his researches in crystals Pasteur took up this problem. Prior to him, leading chemists headed by Liebig had explained the phenomenon of fermentation " in terms of molecular physics", but Pasteur found it to have been caused by tiny organisms. His discovery was that the dust of the air was the carrier of germs. He proved his contention by exposing liquids to the dust laden air of Paris, and the same liquids to pure air on alpine glaciers. In the former case there was putrefaction, in the latter none. He also discovered that these tiny organisms or bacteria would not

live at high temperatures. Therefore, first wine must be heated to the point when bacteria would die, and then it should be sealed from the air. This process is called "pasteurisation" and the wine merchants could now heave a sigh of relief. This discovery was the first milestone in Pasteur's fight against microbe, for he proved that fermentation, decomposition, and putrefactions are all acts of life, and in the absence of life (tiny organisms) do not take place. " A liquid really sterile, exposed to air really sterile, will remain sterile for ever." This theory had to suffer ridicule from Biot and Dumas. But Pasteur worked on undeterred, and inaugurated a new era in the brewing and wine-making industries. The application of the theory to surgical operations in the able hands of Lord Lister brought about miraculous change in the history of surgery. Thousands of lives were saved, and Lister in a famous letter written to Pasteur acknowledged an immense debt to him. This tribute encouraged him to a very great extent.

The second important step taken by Pasteur was his fight against anthrax, a terrible disease which took heavy toll of sheep and cattle, and was ruining the farmers of France. " In the field of observation chance only favours the mind, which is prepared", so said Pasteur once. And literally while he was engaged in researches on chicken-cholera, he found that some fouls inoculated with some old germs did not die, and that when they were latter inoculated with strong germs they remained unharmed. The result was that in case of chicken-cholera, mortality was reduced to 10%, and a clue to the cure of anthrax was obtained. By May 1881, he was sure of his methods, and challenged the disbelievers. He demonstrated his theories before doctors, farmers, and veterinary surgeons. He inoculated twenty five sheep with a weak culture of the anthrax virus, and then some days later inoculated the whole fifty with a very viru-ent culture. The twenty five unvaccinated sheep perished and he twentyfive vaccinated ones survived. This was indeed a iracle

The third victory of his lay in the field of mad dog-bite. 1880, he started his work on rabies or hydrophobia. In is also, first by inoculating animals, he was able to inocu-e men also quite successfully against the disease, and his orts in this line too were crowned with success. There-e, in his honour a " Pasteur Institute " was founded for ventive treatment of hydrophobia. It was in this way

that Pasteur fought a hard and sliff battle against microbes, and ultimately vanquished the enemy. To him, service to man was service to God. "Blessed is he who carries within himself a God, an ideal, and who obeys it: ideal of art, ideal of science, ideal of the gospel virtues, therein lie the springs of great thoughts and great actions; they all reflect light from the Infinite."

Q. 2. *Trace the growth of the fight of mankind against microbes, pointing out clearly the achievements of Pasteur and Koch in this direction.*

Ans. Mr. Fracastorious, an Italian physician of the sixteenth century, wrote a poem on imaginary shepherds and mentioned that illness was conveyed from one person to another in the form of minute "seeds", which were mainly responsible for disease and death. In those days this theory appeared quite fantastic, and yet he further elaborated this "seed" idea in his "Treatise on Contagion". But none took any notice of it.

More than hundred years later in the seventeenth century, the same idea was given expression to by Thomas Sydenham, an English Doctor, and by Kircher, a German, but no further research took place for another hundred and eighty years. Kircher also examined the blood of patients with microscope, and he too found certain "living" particles.

It was in the 19th century that these early attempts attained fruition. Louis Pasteur in France and Robert Koch in Germany took up this task and found out microbe as the cause and source of disease. Joseph Von Pettenkofer applied this thoery to combat cholera which broke out in Munich in the form of an epidemic, when an exhibition was being held there. And Lister applied the fruits of Pasteur's researches in the field of antiseptic treatment, thus "saving millions upon millions of lives", and opening unending vistas in the science of Medicine.

N.B. See Pasteur's contribution in the previous question.

Koch had tackled the problem of the disease called anthrax in his own little town in Germany. After examining with a microscope, he found in the blood of infected animals, tiny organisms which could multiply themselves infinitely. Koch then went to Germany, and there he devoted himself to the discovery of germs of seperate diseases. All over the world, he continued

his fight against the germs. He came to India, went to Egypt and Victoria Nyanza and so on. The Japanese built a temple over a lock of the hair of this man whose work on cholera saved millions of Japanese lives. It is in this way that the fight of humanity against the microbe started in the early years of sixteenth century, and reached its height in the 19th century in the hands of savants like Pasteur and Koch. "There is no greater charm" said Pasteur, " for the investigator than to make new discoveries, but his pleasure is heightene', when he sees that they have a direct application to practical life." This was literally the case with the discoveries of both Pasteur and Koch which have already worked wonders and bid fair to enlarge more and more the frontiers of human knowledge.

Making Surgery Safe

THE IDEA OF LISTER AND SEMMELWEIS

Main points:—

(1) Pasteur, Lister, and Semmelweis were all work ng at different places in 1860's on the same subject.

(2) This search resulted in the discovery of germs or minute organisms, which caused inflammation of wounds, and revolutonised surgery and saved hundreds of lives.

(3) Surgery had advanced sufficiently in ancient India, Egypt, Greece and Rome, but it declined under medieval influences.

(4) It revived again in the sixteenth century, and advanced gradually in each and every century, until the discovery of anaesthetics was made in the nineteenth century.

(5) The epidemic of "Hospitalism", that is, cases of septic after operations were causing havoc in hospitals.

(6) It was Lister, who after vigorous search, came to the conclusion that there were minute organisms which entered wounds.

(7) These minute organisms started their cultivation in the wounds, if favourable conditions were obtainable.

(8) In carbolic he found a very effective antidote against septic.

(9) The discoveries of Pasteur had helped Lister a lot in his new discovery of antiseptics.

(10) Mr. Semmelweis had also reached the same conclusions as that of Lister in his maternity hospital at Vienna.

(11) Lister's method of anti-septic surgery also became the butt of harsh ridicule in Hungary.

(12) Due to the introduction of Lister's methods, the epidemic of "Hospitalism" was wiped out.

(13) From antiseptic surgery, a step forward in aseptic surgery was reached later on.

Summary:--

In the early 1860's, three famous men, Pasteur in France, Lister at Glasgow, and Semmelweis at Vienna were working hard towards a discovery, which revolutionized surgery and saved millions of lives. Lister made it possible to undertake even major operations, without any fear of wounds or incisions later turning gangrenous, or developing some other terrible degeneration. No doubt, the discovery of anaesthetics in the 19th century by James Young Simpson was also to a very great extent responsible for undertaking such major operations, but generally before Lister's discovery of antiseptic surgery, operations proved deadly. Sometimes hospitals were closed in order to get rid of "Hospitalism", a term signifying the terrible epidemic which poisoned the blood-stream of the operated patient. No remedy to prevent this could be found. It was Joseph Lister, who dedicated himself to this task, and ultimately succeeded in his efforts. He studied inflammation, made strange experiments with the foot of a frog and the wing of a bat under his miscroscope. He suspected that there were certain tiny organisms which entered the wounds, poisoned the human tissues as well as the blood as the greenfly destroys the rose. He found a remedy to this in a powerful disinfectant carbolic acid, a by-product of the coal-tar, which the authorities at Carlisle were using on their sewage. Lister introduced this in the hospital wards, in the operating room, and in his surgical bandages. He sometimes sprinkled it in the operation-room, and dipped his instruments in it. The result was marvellous. There was no inflammation or gangrene, and an era of anti-septic surgery commenced.

In a maternity hospital at Vienna, Mr. Semmelweis also reached the same conclusions. But he was ignored by his own

countrymen, what to say of the French and the Germans. The French Academy pronounced his conclusions erroneous, and so did the high pathological authority in Germany. But when Lister came to know of him, he generously regarded him as his forerunner. It was through the noble efforts of Semmelweis that mortality in maternity wards was brought very low.

Lister also knew of Pasteur's discoveries. The antiseptics of Lister further developed in to the aseptics of modern surgery. We have now steam-sterilized overalls, masks and rubber-gloves which doctors and nurses wear. We have perfectly sterilised instruments, and also steam sterilised clothes in place of blood-stained garments, which carried microbes from one wound to another.

.t was in this way that most spectacular results were achieved in surgery. We divide the history of surgery in to two eras, one anterior (prior to) to Lister and the other posterior (later in time) to him. In ancient India, Egypt, and Greece, there was remarkable knowledge of surgery, but it declined in the Medieval times and moved steadily forward through the seventeenth and eighteenth conturies, and was restored to a glorious position under the able guidance of Lister and Semmelweis.

Questions and Answers

Q. 1. "*By the quiet persistence of the truth-seekers working upstream against the flow of ancient prejudice, mankind has entered in to new realms of health and the border lines of death have been pressed further back.*"

(*Horace Shipp*)

Elucidate the above with reference to Pasteur, Lister, and Semmeleweis.

Ans The above eulogistic statement refers to the revolution brought about in the field of surgery by three illustrous figures, namely, Pasteur, Lister and Semmelwies. All these three had to wage a long and bitter fight against the established scientific theories. They never lost heart, but found inspiration in the following lines of Longfellow, and ultimately won laurels.

Let us, then, be up and doing
With a heart for any fate;
Still achieving, still pursuing,
Learn to labour and wait."

Pasteur's discovery of dust-laden air as the cause of the putrefaction of wine was ridiculed by men like Liebig, who clung to the old idea that life somehow generated itself. But it is mainly Pasteur's discovery that ultimately brought in an era of antiseptic surgery. Lister, the saviour of pestilence-stricken humanity, further worked upon it and achieved miraculous results. Pasteur had to suffer disdain from Biot and Dumas also, who discouraged him in his experiments. But Pasteur persevered, and his labour and patience had ultimately their due meed of success.

Look to the terrific conditions in hospitals before Lister's discovery of tiny organisms or microbes, which by entering the incisions or wounds vitiated the life-blood, and set up their own life-destroying process. Luckily, in the middle of the 19th century, anaesthetics had been introduced by James Young Simpson, thus relieving the pain of operations and making major operations possible. But ironically enough, what Nature had given with one hand, she snatched away with the other. Most of the operations grew gangrenous and patients could not be rescued from clutches of death. When Lister was appointed to the chair of surgery in Glasgow, the infirmary (hospital) of that city was "a hot-bed of septic diseases." James Simpson, early in the sixtees, pathetically denounced the awful mortality of operations in hospitals. It was Lister who found out the real cause of this pestilence, and set up the barrier of carbolic acid between the incision and the dust-laden air. With the help of this disinfectant, he performed even major operations of compound fractures quite successfully. and as he himself says, "He had the joy of seeing these formidable injuries follow the same safe and tranquil course as simple fractures." Yet this benefactor of humanity was reviled and scorned by the blindly prejudiced people. All their weapons of ridicule and irony were aimed at "Spray and Gauze School", as were Lister's methods called.

It was Semmelweis, who had to face a more terrible fate than any of his co-workers. Actively engaged in his researches in a maternity hospital at Vienna, he had also arrived at the conclusion reached by Mr. Lister. "The thing flared into an unreasoned persecution of the pioneer by old traditional men." He was reviled, laughed at and dismissed from his job for advocating this new method. This broke his heart, and made him temporarily insane. No body viewed these discoveries in the light of Byron's remark who once said, "It is strange but true, for truth is always strange, stranger than fiction."

Despite these formidable difficulties against which all these three souls and many others of their class had to fight, they persevered in their experiments and researches, and ultimately established the sway of truth over falsehood. For did not Emile Zola say, "If you shut up truth and bury it under the ground, it will but grow, and gather to itself such explosive power that the day it bursts through it will blow up everything in its way."

Q 2 "*A feeling heart is the first requisite of a surgeon.*" Expand. *(Joseph Lister)*

Ans. "Example is better than precept", and what Lister has uttered in the above line was practised by him in his own life. Therefore, the above epigram is verily a piece of autobio graphy. Did not Lister feel touched when he saw incisions (cuts) and wounds growing gangrenous, and mortality stalking through wards. As the cause of the festering of wounds was quite uncertain, new wards and new hospitals were built, yet after a very short time, the new ones became as pestilential as the old, and even scrupulous care in ventilation and cleanliness failed to prevent the devastation (destruction). It was this plight of the patients, which melted Lister's heart and made him work ceaselessly on inflammation of wounds which resulted in a terrible epidemic called, "Hospitalism". But this very epidemic was one day eradicated (rooted out) by setting up the barrier of carbolic against the infected air. Rightly has Lord Tennyson said, "Kind hearts are more than coronets." If Lister had not a feeling and kind heart, surgery would never have been so safe today as it had been for his unremitting labour. Another scientist Pasteur, who paved the way for Lister, also remarked once in a very feeling manner, "It would indeed be a grand thing to give the heart its share in the progress of science." Therefore, kindness, compassion, and a charitable disposition are the essential qualities of a surgeon as well as a scientist. It is only, when a surgeon feels and suffers with the patient, that he can be eminently successful in his tedious job.

Q. 3. "*A Scientist's life is his work.*" Lister
Elucidate

Ans. A scientist's greatness is to be judged by his deeds. It is the service rendered to humanity, which constitutes the real work and worth of a scientist, and the moments of life spent in it are the true moments of worthiness. The work may be theoretical or practical, both are equally precious, for did not Pasteur

address these words to those who only prize practical achievement. "Without theory, practice is but routine born of habit. Theory alone can bring forth and develop the spirit of invention." Scientists may fail or succeed, but if they work in true earnest, they richly deserve our meed of praise, as Longinus once aptly remarked : "In great attempts it is glorious even to fail." Did not the poet Browning, "brave among the brave", ask people to suffer the slings and arrows of fortune with a calm and happy temper, and also to face success as well as failure with equanimity (evenness of mind or temper). Therefore, success and failure do not matter at all. It is the nature and the spirit of the work, the means employed and the end pursued, which make it noble or ignoble, dignified or low. Did not Carlyle say, "All true work is sacred...."

Is not Lister's work the whole of his life, the true life, the life that makes him join the band of immortals ! Did he not check terrible fractures and gaping wounds from turning gangrenous and proving fatal, and thereby saved millions of precious lives. God dwells also in the hearts of the lowly and the downtrodden, and service rendered to suffering, grief-laden humanity is a silent prayer uttered at His altar, a prayer that goes straight to the Great Saviour.

When we read the life accounts of other scientists also, we find that it is their work which counts. Even their defects and blemishes, if there be any, are drowned in that perennial (everflowing) stream of work. It is through work that life expresses itself. Have not Pasteur, Newton, Galileo, Lister and many others made themselves immortal through their work. They were people with "a lasting provision of faith and fire" as Pasteur once asserted about himself, and it is through their work that they could convey to posterity their zeal as well as ennobling faith. It is the element of work, the inborn interest in science, which links together all the scientists though born in different environments and circumstances. Count Rumford and Lavoisier moved in high circles, and held important state appointments, but these details of their lives are forgotten, their work alone is remembered and constitutes their life and charm.

Cavendish, the great scientist was a notorious misanthrope (hater of mankind); Darwin was always bed-ridden and sickly; yet their names are held in high regard, because of their glorious work. The workers are the saviours of society, the redeemers

of the race and, therefore, "A scientist's life is his work" in the true sense of the word.

Q. 4. *Describe the achievements of Lister and Semmelweis in the field of surgery.*

Ans. See the summary and other questions.

Signals Round the World

SAMUEL MORSE AND THE TELEGRAPH

Main Points.

1. The need of exchanging views across long distances has been one of the oldest needs of humanity.

(2) Galileo by the invention of magnetic needle, and William Sturgeon by electro-magnet prepared the way for the invention of telegraph.

(3) It was on board the ship "Sully" that Mr. Morse first heard of the electro-magnet. It was then that the possibility of transmitting news along a wire flashed through his mind.

(4) This idea so captured his mind that he gave up painting, his main source of livelihood, and for the study of which he had been to Europe.

(5) He passed his days in poverty, always experimenting on the possibility of transmission of news with the help of electricity.

(6) On May 24th 1844, he succeeded in transmitting a message along the first telegraph line erected between Washington and Baltimore.

(7) It further led to the invention of cable, and thus the science of communications was revolutionized.

Summary:—

Since long humanity had been expressing its urge for conveying messages from one part of territory to another. Drum-taps or smoke-signals, beacon-fires from hill-tops, semaphore signals, all express this urge of humanity. In the eighteenth century, the father and two brothers of Maria Edgeworth experimented with the sails of windmills in transmitting news to other places. Then followed Mr. Gamble's use of holed lathes for this purpose, and lastly railway signals were invented by Home Popham.

In 1825, followed the invention of electro-magnet by William Sturgeon. A few years later, from a discussion about the electro-

magnet, the idea was born, which gave us the telegraph. Mr. Samuel Finlay Breese Morse was sailing from France to Newyork on board the ship "Sully" after his travels over Europe in order to gain a deeper knowledge of painting and designing. As an artist, he was a very talented figure, because even at an early age of thirtyfive, he had been appointed Professor of Design at Newyork University. One day while on board the ship Sully, after his dinner, he was conversing with one Dr. Jackson. The doctor became eloquent over the wonders of electro-magnet. The electric current, he pointed out, could travel along the wire instantaneously.

The doctor went on telling that the famous experimenter Benjamin Franklin had once demonstrated this by stretching a wire across the river at Philadelphia. Now, Morse began to think on this very topic, and the possibility of flashing news over distant areas through electric sparks took a dim shape.

On board the "Sully", this idea seized his mind, and Morse began to draw sketches, designs, and diagrams. The artist was lost in the scientist. If he now worked as an artist, it was just to earn so much as to make his both ends meet. Such was the fascination of this new discovery. His material for experiment, he gathered from anywhere and everywhere. He pieced together parts of old picture frames, collected pieces of iron from rubbish bins, and got scrapped wire and wheels of a worn-out clock from wherever he could have them.

When he had completed his model, he went to Washington to demonstrate this idea by erecting a line from Baltimore to Washington. For this he sought a grant from the Congress, which was granted with difficulty at its last sitting.

In March 1843, his poverty had reached such alarming depths that he had only one dollar left. Prevoius to this, when he demanded tuition money from his pupil, and the latter promised to pay it next week. Morse had to make the abject confession that he would die of starvation by then. Such was the sacrifice and the suffering of this inventor of telegraph.

As soon as the grant was made, the work of erecting the first telegraph line commenced. To the surprise of all, on May 24, 1844, Morse was able to convey the following message from Baltimore to Alfred Vail at Washington, forty miles away.

"What God hath wrought."

Its importance captured the imagination of the people only

when the convention of the Democratic Party in Washington elected Silas Wright as its Vice-President, a Baltimore man. Wright's refusal to accept this honour was telegraphed within ten minutes. This was the beginning of a new era in the sphere of communications.

Fourteen years after this triumph, another triumph followed. On the 17th August, 1858, a trans-atlantic cable linking America with Europe was laid, and the following message was conveyed; "Europe and America are united by telegraph. Glory to God in the highest, on earth peace, good will towards men."

This was the first trans-atlantic cablegram and the success of the land-wire was repeated on vast areas of water.

Questions with Answers.

Q. 1. "*The urge to signal across distance was one of humanity's oldest needs.*" *(Horace shipp)*

Prove the truth of the above.

Ans :--The problem of conveying messages to distant places had been taxing the minds of people for several hundred years. We read the stories of pigeons playing the role of messengers in old times. Savages used drums or smoke signals in order to convey their messages and to call assemblies or huge gatherings of people. Then came the use of semaphore signals by flashed lights or reflected sunlight. It was in this way that mankind persevered in inventing better and better means of communication, till it achieved astounding results in this direction.

In the eighteenth century, Maria Edgeworth's father and her two brothers used sails of windmills for the purpose of conveying messages. The position of the sails represented letters. Later on, they used pointers by erecting them on highmasts. Then Home Popham invented railway signals which the Admiralty also used for indicating the arrival and departure of ships. Telegraph Hills between London and Portsmouth are the existing witness of Pophams' ideas.

As back as 1632, Galileo had guessed the possibilities of magnetic needle in this direction, but it was only in 1825 that William Sturgeon invented the electro-magnet, and prepared a very fruitful ground for Mr.Morse. It was from Mr. Jackson that Morse heard of the possibility of flashing news with the help of electric currents. The idea so possessed Mr. Morse's mind that he sacrificed his all to explore its possibilities, and

ultimately reaped the reward of his labour when he was able to invent the telegraph. It is indeed a wonder that deserves well the gratitude of posterity.

Q 2. *"Nothing but the knowledge that I have an invention which is to contribute to the happiness of millions has sustained me."* *(Mor·e)*

What invention and what circumstances are referred to in the above statement?

Ans. When Mr. Morse was on board the ship "Sully", he heard the story of the wonderful discovery of electro magnet by Mr. Sturgeon. Mr. Benjamin, working upon this idea, had demonstrated by stretching a wire across the river at Philadelphia that an electric spark touched at one end flashed immediately at another. It was there that the idea of using electric spark to carry messages took dim shape. Immediately, he commenced sketching drawings and diagrams to give a concrete and workable shape to this idea. It was in New York that he gave up painting except as a means of eking out a livelihood in order to give a practical shape to this idea. The result was that he became penniless, and had to live on tea and biscuits, working hard as a teacher and struggling fiercely against grave difficulties. It is strange that he had not even the money and material to experiment on this idea. Therefore, he managed to gather parts of old picture frames from somewhere, pieces of iron from heaps of rubbish, wheels of a worn-out clock and wire too from such similar source. This is the story of his heroic struggle, and to this he refers in the above statement.

Q 3. *"The telegraph is a powerful advocate for universal peace." Expand.*

Ans. This statement by the inventor of the telegraph, Mr. Morse himself, is true to a very great extent. It cannot of itself command millions to be peaceful and to give up their bitter animosities, but undoubtedly it can help people to explain away very quickly those happenings and facts which might arouse doubts and suspicions. Peace has been the crying need of the afflicted humanity for hundreds of years. The world has seen several prophets of peace. For example, Christ preached peace and is rightly called, "The Prince of Peace." Buddha, Asoka and Gandhiji, all dedicated themselves to the cause of peace. Yet humanity today is in difficulty, and does not know how to establish peace.

Man has tried to establish peace through various inventions and one such is the telegraph. It is through this medium that countries situated at the extreme ends of the globe can exchange views and dispel mutual misunderstandings, suspicions and fears. Telegraph of itself can not ensure peace, but it can indeed be a very successful agency in achieving peace by enabling mankind to have a frank and honest exchange of views, which can remove all those causes which lead to a war.

Rapid interchange of thoughts and ideas has become a marked feature of the twentieth century as the barriers of time and space have been annihilated. World today is essentially one. If humanity is to survive the dissensions and feuds which rage to-day, it is only through means like telephone and telegraph, which alone can pacify agitated and troubled minds even across long distances. Therefore, the importance of telegraph in the modern world has to be understood rightly, and due honour is to be accorded to its inventor who gave to humanity one more instrument for establishing peace on this globe, where thousand discords ring day and night.

Q. 4. *Point out the various incidents which led to the discovery of the telegraph.*

Ans :—See the summary.

Distant Voice

ALEXANDER BELL AND THE TELEPHONE

Main points:—

(1) The discovery of telephone wa made by Alexander Graham Bell on a certain day in March 1876.

(2) Born in Scotland, he had to emigrate to America to save himself from a threatened attack of consumption.

(3) He set up his own school of the deaf in Boston like his father's in Scotland.

(4) He contracted friendship with Mr. Watson, an electrician with whom he collaborated in perfecting his invention.

(5) Finding, his invention failed to win recognition, he demonstrated this discovery before the public in an exhibition.

(6) The emperor of Brazil and Lord Kelvin were the first eminent personalities to recognise the merit of this invention.

(7) This invention gained immediate popularity in Germany and at a few more places on the continent.,

(8) It also found very strong champions in Bernard Shaw and Queen Alexandra.

(9) Further improvements on this invention were made subsequently by other scientists.

Summary:-

Alexander Graham Bell was born in Scotland. His father was running a school of the deaf in Edinburgh, and tried to make them speak by means of lip-reading and the vibrations of the throat. A. G. Bell helped his father in this task, but at the age of twenty-three he was sent to America for a change of climate as he showed some signs of consumption. In America, he pursued his father's vocation, and desired to invent an instrument which could make sound visible. He set up his own school of deaf in Boston. Luckily, two of his pupils were descended from rich families, and they got interested in Bell's pursuit.

He then contracted friendship with an electrician, Mr. Watson, and aimed at producing audible sounds in place of visible ones. They made many unsuccessful attempts by using all types of discs, all manner of writing and various other apparatuses. It was on a March day in 1876, that his efforts were crowned with success From the top storey of his house, he said to Mr. Watson at the basement, "Mr. Watson, come here ! I want you," and the latter rushed upstairs with the happy news that he had heard almost all that he had spoken.

In the twenty-ninth year of his life, he got a patent for this discovery, but several years were to roll on before he could acquire fame. His invention of the telephone won recognition and publicity in the following manner:—

The centennial Exhibition was held at Philadelphia, and Hubbard and Sanders pressed him to put up his instrument there for a show. To the people, it was not at all a matter of importance. It was on the final day of the exhibition that Bell's fortune was to experience a change for the better. The emperor of Brazil visited the exhibition, and he at once stopped at Bell's shop. He had already paid a visit to his school in Boston. He demanded a demonstration of the new instrument (telephone) and with great amazement ejaculated, "My God, it speaks !" Lord Kelvin, the great English scientist and his wife also were full of excitement over this discovery, and rushed in the hall from end to

end in order to test the instrument. Bell now came to the limelight. In 1877, the British Government refused a demonstration of the instrument within its territory, but telephonic communication was set up between a number of German villages the same year. Queen Alexandra, the then Princess of Wales, got a telephone set up between her rooms and her children's nursery and so established a fashion in England. Strangely enough, Shaw too canvassed for it in 1879. Triumph upon triumph followed in quick succession, and the invention was brought to its present glory by Edison, David Hume, Blake, Henry Hennings and several others. But the real beginning was made by Mr. A. G. Bell. It was really in the fitness of things that when Mr. Bell passed away quietly in 1922, the seventeen million telephones in America and Canada remained silent for a minute as a tribute to the architect of telephonic communications.

Questions and Answers

Q. 1. "*The idea of using the scientific fact of vibration to convey sounds along wires had tantalised a number of minds before Bell brought it to practical use.*"

(*Horace Shipp*)

Develop the above idea.

Ans:—Every scientific invention is invariably in its early stages a dream. All the inventions and discoveries, of which humanity can feel proud today, were once only dim ideas in the minds of certain people. It is only with the advent of a genius that the dream is transformed into a reality.

This did happen even in the case of telephone. Before the idea of conveying audible sounds by means of electricity took concrete shape, it had tantalised the minds of many people. For example, Helm holtz, a German amused himself with this idea by putting two cups and by stretching a wire between them. But he did not meet with any encouraging results, and therefore he gave up this search in favour of optics. But he referred again to the theory underlying it in his famous work, "Sensations of Tone", and this book proved indeed a source of inspiration to Bell. Charles Wheatstone in 1821 experimented with a strange type of instrument, employing the same principle to convey musical sounds. He named this instrument happily as "The enchanted lyre." There was another German, Philip Reis, who too prepared a like instrument of crude material and shape, and succeeded in obtaining some musical notes and even some

vowel sounds, but did not succeed in conyeying human speech. Then came Charles Bourseul, a French man who abandoned the attempt, and Elisha Gray, an American, invented this instrument just a few hours after Mr. Bell. Thus the idea was in the air throughout the middle of the 19th century, but the honour of giving to it a concrete and workable shape belongs to Mr. Bell.

Q. 2. "*All really big discoveries are the result of thought patiently pursued.*" *(Bell)*

Develop the obove idea with reference to the invention of telephone.

Ans :—"Leave the beaten track occasionally and dive into the woods", so said once Alexander Graham Bell. This is not possible unless a man has at his beck and call, a huge fund of patience, which alone can bring to light all the hidden treasures of human knowledge. It may also be called the quality of perseverance. Is it not that Franklin said, "He that can have patience can have what he will." Pasteur persevered and at last won success; so did Morse, Marconi and a host of others. Not only they strove after their cherished theories with patience and devotion, but suffered much by way of renunciation and self-denial. Bell's life too is a very good illustration of how he had to wait for a long time before he could succeed in inventing the telephone. If he were lacking in patience, he would have given up his pursuit long back in a mood of sore disappointment. But he was a man endowed with robust opitimism, and pursued the object of his discovery ceaselessly, day and night. A day soon dawned when his long labour bore fruit, and made his name not only famous and widely-known, but put him in the roll of the greatest benefactors of mankind.

Q. 3. "*We broaden our field of knowledge and reach generalisations of considerable magnitude as the result of numerous small thoughts brought together in the mind and carefully considered.*"

Ans. The vast field of knowledge, which has become our province today, is due to the painstaking work done by a large number of people. It is not the creation of any one man. There is no doubt that there have been different types of degrees of contribution to the sea of knowledge made by different people. Similarly, all the important theories, inventions, discoveries and generalisations of science are the work of numerous people. All these people directed their energies to the pursuit and discovery

of knowledge. By means of their individual contributions, we have been able to accumulate vast treasures of knowledge. If these discoveries or individual thoughts were not piled together, the store of human knowledge would never have been so rich and pentiful as it is today. It should never be thought that a particular invention is the work only of a particular man. We should never ignore the contributions made by his predecessors. Therefore knowledge is a growing process. It is always growing and expanding, due to the contributions of large number of people who strive for its attainment. The history of the invention of radio, aeroplane, telegraph and telephone all bear out this point. Numerous small thoughts when pondered over by talented people, further give birth to other thoughts and thus make the growth of knowledge possible.

Q. 4. *Point out how did A. G. Bell succeed in gaining recognition of his great and wonderful invention?*

Ans :---See the summary of the chapter.

The Miracle of Radio

THE IDEA OF MAXWELL, HERTZ AND MARCONI

Main Points :—

(1) Telegraph, telephone and radio mark the three successive stages in the growth of the means of communication.

(2) Tremendous possibilities are yet likely to be opened up by wireless.

(3) Maxwell, Hertz, and Marconi are the three great scientists who brought wireless to its present developed stage.

(4) Sir Oliver Lodge, Prof. Righi and Oliver Heaviside are other names associated with its growth.

(5) James Clark Maxwell guessed that light and electricity were in some way parts of the same thing.

(6) He discovered after much hard work that waves of light and electricity moved at the same speed.

(7) Hertz proved the truth of Maxwell's theory after a period of twenty three years.

(8) Hertz also arrived at the conclusion that waves of electricity behaved exactly as other waves in Nature did. This established the possibility of wireless communication.

(9) Marconi learnt from Prof. Righi that electric waves could jump across space.

(10) On the basis of the above, he conducted experiments in his father's garden and was successful.

(11) In 1896, he again experimented from the roof of the General Post office in London and succeeded.

(12) Marconi's supreme test came when he succeeded in receiving Morse signals at a distance of three thousand miles from Cornwall to Newfoundland.

(13) Through wireless, distress signals from ships have been transmitted, and numberless human lives saved.

(14) It is hoped wireless energy will work wonders in other fields of human activity as well.

Summary :—

Radio is a more wonderful invention than telegraph and telephone. Further growth of science will rest on the electrical waves which form the foundation of the wireless.

There are three famous men who opened up before us this new path to progress, namely, James Clark Maxwell, an English man, Hemirich Hertz, a German, and Gugliemo Marconi, an Italian. Maxwell prophesied wireless, Hertz discovered those waves which form its basis, and Marconi invented those instruments with which this idea was given a concrete shape. Only a year before Marconi, Sir Oliver Lodge had showed the possibility of sending a signal by the Hertzian waves, but gave up this noble attempt later on, due to pressure of some other work. Professor Righi, Marconi's science master, showed him the path which led ultimately to the discovery of the wireless. Similarly Oliver Heaviside contributed a lot to the discovery of the wireless.

James Clerk Maxwell was born in 1831. He is associated with Newton as a type of intuitive genius. His main theory was that light and electricity were in some ways parts of the same thing. He felt certain that electric energy moved in the form of waves. He wanted to measure those waves but could not. His work was mainly of mathematics and calculation. His main discovery was that light waves and electric waves moved at the

same speed, something like 186,000 miles per second. It was through the discovery of wireless that a link was later established between light and electric waves.

Twenty-three years after this discovery, Henrich Hertz proved the truth of this theory. In his days electric currents of shorter frequency could be experimented upon. After conducting experiments, he was able to find out that waves of electricity behaved exactly as other waves in Nature did, a fact which he demonstrated across a few feet in his laboratory. Through experiments on waves, he finally established the possibility of wireless communication. A few years had yet to pass before these electric waves could be utilized in the service of mankind.

It was Gugliemo Marconi, who put the above theory to practical use. His Professor Righi had demonstrated that waves of electricity could jump across space. An electric spark from one end of a coil could be picked up by another piece of coil, though there be enough space between them. He made further experiments which corroborated this view. Therefore, it was now an indubitable fact that electric force did not need wires to carry it from point to point, it could jump space.

He further experimented on the above theory in his father's garden. Gradually, he reached a stage when by fixing two poles at opposite ends of the garden, the signals could be received even at the distance of a mile. Even a hill between the two points did not constitute any barrier. Now, the problem was to produce signals strong enough to be recorded, and this depended mainly on having a long aerial in which the electrical vibrations could take place. The capacity of an aerial for reception almost doubled, if it was placed vertically instead of horizontally.

He submitted his invention to the British Government in 1896, and later experimented from the roof of the General Post Office in London. He succeeded in sending messages even across the Bristol Channel, and next year even across the English Channel. Queen Victoria sent a message from Osborne House to the Prince of Wales on board the royal yacht. In this manner this discovery began to play an important role in naval affairs.

People still harboured doubts about the unlimited range of the wireless. They thought that the curve of the earth would interfere. In December 1901, Marconi set up his signal station in Cornwall, and quite secretly he went to Newfoundland which was at a distance of three thousand miles. He instructed his assistants to transmit three dots signal of Morse at a certain

hour of a certain day, and he would listen in on a telephone attached to a nine-feet kite flying four hundred feet in the air. The result was not only encouraging but a sort of miracle. Marconi heard the treble signal and opened a new chapter in the history of the science of communication.

Henceforth, wireless sets were fixed on ship boards, which recorded news from the land. In 1903, a ship was saved from disaster with the help of these wireless signals.

It is sincerely hoped that wireless telegraphy would assume greater and wider growth day by day, and would work miracles in every field of human activity. It is expected that aircraft will be directed from the ground by wireless energy and all kinds of communications too will be controlled by it.

Questions with Answers.

Q. 1. "*Telegraph, telephone, radio, the story of the conquest of communication by electrical energy has three chapters, and the marvels of the first and second pale before the miracle of the third.*"

(Horace shipp)

Explain the truth of the above statement.

Ans. It was samuel Morse who invented the telegraph, and with his famous Morse Code unified all the world, and made possible exchange of thoughts from one corner of the globe to another. Then followed the discovery of the telephone by Alexander Graham Bell, so that we have today more than thirty-five million telephones enabling mankind to converse across space, from room to room, from city to city, and from country to country. Last, but not the least important, came the miracle of radio, the credit of which goes to Marconi. Even at an early age of twenty, Marconi directed all his energy to one single aim, the invention of the wireless. At last he succeeded in his noble efforts.

Wirlees has proved of more use to mankind than telephone and telegraph. It has proved of immense help in contacting vessels on the sea from the land. Wirless has conquered space and annihilated the barrier of time. Its real utility came to light in 1903, when the liner "Republic" used wireless for the first time to send distress signals at the time of its collision with another vessel in the Atlantic. It meant saving numberless lives, a process which has been continuing since then.

The development of wireless has not ceased. On the other hand, it is "continually expanding into fresh triumphs." Electric waves constitute the most powerful force in the world, so far discovered by man. We may hope for the dawn of the day, when still more miraculous achievements will be the precious possession of mankind, and man will be in a true and real sense the crown of this creation. To quote Horace shipp in full; "To-morrow the science of healing, the control of vast forces, navigation, aeronautics, television, the amenities of life in a score of directions" will depend on the electrical waves, which do not require any wires to transmit them across space.

Q. 2. *Trace the growth of the wireless and point out the contributions made to it by different scientists.*

Ans. See the summary.

From Balloon To Air Liner.

THE IDEA OF AVIATION

Main Points:-

(1) The vision of the conquest of air has haunted men's minds from very old times.

(2) The ballon took a concrete shape in the eighteenth century In the hands of Montogolfier Brothers in France. The experiment was repeated in the presence of King Louis of France.

(3) Marquis of d'Arlande was the next man to fly in a balloon and in his second flight he fell a martyr to aviation.

(4) Experiments on balloon travel continued unabated even in the nineteenth century.

(5) During the nineteenth century three English men, George Cayley, W. S. Henson and John stringfellow worked on the construction of a flying machine, but did not meet with any remarkable success.

(6) Otto Lilienthal, a scientist of Germany, made some successful attempts at flying in his gliders but died in one of the attempts.

(7) In America, two brothers, namely Orville and Wilbur Wright, took up the work of constructing an aeroplane from where it had been left by Otto Lilienthal.

(8) Commencing their attempts in 1900, Wright brothers finally succeeded in flying a machine three years later.

(9) Aviation is still a growing science.

Summary :--

The vision of flying in the air has been the dream of mankind from very hoary times. Even in the Greek mythology, we hear the story of Daedalus and his son Icarus, escaping from king Minos and reaching too near the sun, which resulted in melting the wax of the wings of Icarus. This idea continued to agitate the minds of people even in the Middle Ages and the Renaissance. In the thirteenth century, Roger Bacon, the father of modern science, experimented on the lifting power of cylinders filled with hot air. Albert of Saxony in the fourteenth century and Leonardo da vinci, the famous Renaissance painter of Italy, tried to fly on wings modelled on those of the birds. We have also the story of a daring Italian adventurer who flew down with wings from the walls of Stirling Castle. It is in this way that the dream of flying in the air like birds passed from generation to generation, making a deep appeal to the imagination of people.

Then followed experiments with balloons, first undertaken by Monfgolfier Brothers in France. The smoke coming from the chimrey of their paper mill gave them the idea of filling a silk-bag with air, and making a man sit on a platform beneath it, so that he could constantly fill it with smoke. Twice the experiment was made without being attended by a man. Once it went up sixty-feet in the air and second time nearly six thousand feet. The experiment was afterwards conducted in the presence of King Louis of France. Two criminals under a death sentence were to be flown with the balloon. But a certain man thought it a glorious act to fly with the balloon and acoordingly, volunteered himself for the journey. He was the first man to fly in the air. This time too the balloon was tethered with a rope and controlled from the ground.

Then came Marquis d'Arlande who made an attempt to fly in his balloon without attaching any strings to it. He flew and the balloon caught fire but it was extinguished. He covered a distance of five miles in the air. Next time, he ventured again, but lost his life as the balloon in which he was sailing caught fire.

It tho nineteenth century, people made further attempts to fly

in the air with the help of balloons, but complete success could not be achieved.

During the nineteenth century, three English engineers worked on heavier than air machines, and paved the way for ultimate success. George Cayley toiled for more than fifty years, but failed to win complete success. W. S. Henson made a model aeroplane and invested his entire fortune in it. Thereafter, he tried to float a company to further his designs, but none paid any heed to it. John Stringfellow also worked successfully in constructing an aeroplane. He displayed his models and won prizes at the exhibition of the newly formed Aeronautical Society of England. The shortage of money retarded further progress with the result that mankind had to wait nearly forty years for its first aeroplane.

A German scientist, Otto Lilienthal, made hundreds of sketches of the wings of birds over a period of twenty years, and in 1891 succeeded in completing his glider. He further demons trated that flying in the air needed a sort of navigation, because air was full of whirlpools and waves. Moreover, he stressed there must be some agency to push up the plane in the air from beneath the wings. He made two thousand flights and was killed in one of the ventures.

Two brothers in America, Orville and Wilbur Bright, read of the "bird-man's death." Like Lilienthal, they too made a study of the flight of birds, and took up his work in hand when he had been killed in the course of his flight.

For full five years, Wrights conducted experiments. They constructed a wind tunnel in which they tried their models, and in 1900 prepared a glider. Two years later they prepared a bi-plane, and in 1903 they took their plane to the sand banks in North Carolina. It was a bleak winter morning and only four persons and a boy came out to witness the performance. The newspapers also did not mention it in their columns and, strangely enough, Wrights also did not care for it as they did not crave for any advertisement.

Since the day at Carolina, the progress in air-navigation or airflight has been quick and marvellous. In 1905, the Wrights flew twenty five miles, and in 1908 they flew fiftyone miles. Next year Bleriot crossed the Channel and thus the art of aviation advanced with rapid strides, with the result that to-day jet-projected screwless areoplane is an accomplished miracle of air-travel, promising movement at 500 miles or more an hour.

Q. 1. *To conceive a flying-machine is nothing. To construct one a little. To fly one is everything."*
(Otto Lilienthal)

Bring out clearly the import of the above statement.

Ans.--The desire of flying in the air is one of the oldest desires of mankind and can be traced back to hoary past. Even in the classical myths of ancient Greece, we find the story of Daedalus and his son Icarus flying with wax wings, and reaching too near the sun, which resulted in the melting of the wax. Later, we find the visions of flying-machines entertained by people in the Middle Ages and the Renaissance. Roger Bacon, Albert of Saxony, Leonardo da Vinci, and others too conceived the idea of flying in the air in one form or the other.

This dream or idea began to be translated into reality in the eighteenth century. For the first time, Montgolfier Brothers tried to fly a balloon tied with a rope and controlled from the ground. This experiment was later repeated in the presence of King Louis, and this time a man was flown in it. The experiment came out quite successful.

The next man to embark upon this undertaking was Marquis d'Arlande. He made a five-mile flight in a balloon. The poor fellow became a victim to his own experiment as the balloon caught fire while flying.

In the 19th century, three British scientists made further efforts to construct heavier-than-air machines which could fly in the air. They prepared models of such machines, but monetary help was not forthcoming, and therefore the experiment failed to attain any marked degree of success.

It was in 1891, that a German scientist Otto Lilienthal manufactured gliders, with the help of which flying from high altitudes to a lower height was possible. He achieved this degree of success after a ceaseless study of the flight of birds for over a period of twenty years.

The final success came only with the Wright Brothers. They not only succeeded in manufacturing a flying-machine, but actually flew in the air taking their lives in their hands, and brought the art of flying to its present advanced stage.

The history of the growth of aeronautics in itself bears out the truth of Otto Lilienthal's remark. What is there in the vision of a flying machine? Even a man without the

slightest streak of the scientist in him can conceive of it. History and mythology both bear out that from very very old times people have entertained sweet dreams of soaring high in the sky like birds of the air. Even Tennyson, the poet Laureate, once dreamt of flying in the air in these lines :--

"Saw the heavens fill with commerce, argosies of magic sails,
Pilots of the purple twilight, dropping down with costly bales;
Heard the heavens fill with shouting, and there rain'd a ghastly dew,
From the nation's airy navies grappling in the central blue".

The second stage in the growth of aeronautics is that of constructing a flying machine. It requires constant work, unflagging energy, and immense technical skill and insight. The crude stage of an aeroplane is to be found in a glider.

The third stage, that of flying a machine after constructing it, is the most difficult and risky. It involves tremendous risk to the life of the entrerpriser, and the history of the aviation itself points out that many people became martyrs to it.

Hence, to coneive of a flying machine, is like the working of a child's mind who always thinks of impossible things. To construct a flying-machine is a bit more difficult sort of work. To fly in it after its construction is the real thing, which counts and deserves our admiration and praise.

The Sign of the Red Cross

AN IDEA OF HNERI DUNANT.

(1) Henry Dunant went to the battle town of Solferino on a business errand to meet Emperor, Napoleon the Third.

(2) He failed to meet the emperor, but was deeply touched by the ghastly scene of the casualties of the Austrians.

(3) He nursed the wounded soldiers with the assistance of a band of Italian peasants.

(4) He published a book, " A Memory of Solferino " and circulated it among a vast number of people, who were much moved on reading this lamentable tale.

(5) In October 1863, an International Conference was called at Geneva, over which not Dunant, but his colleague Moynier presided.

(6) In the ensuing year, the Swiss Government extended an invitation to convene the conference.

(7) It was at this conference that the rules for the care of the wounded were framed and became part of international law.

(8) When Prussia attacked Denmark, Dr. Appia, wearing a Red Cross as an armlet, undertook the nursing of the wounded.

(9) Henri Dunant, whose business in Alegeria had suffered a crash, ceased to occupy any place in the organization.

(10) It was after fifteen years of the first Conference, that due recognition was accorded to the services of Dunant by awarding him a Nobel Prize, through the efforts of a school-master.

(11) Dunant failed to recover from the shock of this neglect, and died as a sick man eighteen years later.

Summary:--

It was on the 24th June, 1859 that on the battlefield of the little town of Solferino, Napoleon the Third, with the assistance of Sardinians, massacred thousands of Austrian soldiers, and wounded more than forty thousand of them within fifteen hours.

Henri Dunant, a renowned banker and company promotor of France, had started a business in Algeria, and wanted to secure certain concessions from the French Government that had been denied to him by the Colonial Department in Paris. He desired to meet the emperor himself, and win from him those very concessions in the glorious hour of his triumph. He failed to meet the emperor, and was touched to the core by that scene of carnage.

Being touched to the quick, he went to the battle field, where the wounded and maimed soldiers lay in a very pitiable and desperate condition, standing in urgent need of succour from some merciful hands. He nursed the wounded, and served water to those whose tongues were blackened with thirst. In this angelic task, he was assisted by a band of three hundred Italian peasants. "We are all brothers" became the watch-word of this band of angels.

Henri Dunant returned to his native town of Geneva, but he could not drive out from his memory the impressions of the tragic scene witnessed at Solferino. His business suffered as his heart swelled with pity. He gave expression to his feelings in a small pamphlet entitled "A Memory of Solferino", which he sent free to all his distinguished friends and acquaintances. The book created a furore throughout Europe, and moved all those who read it.

The thought of calling a Conference seized Dunant's mind and that of his four friends. He went from door to door and from place to place, urging the people to lend their helping hand to the cause he advocated. The conference was attended, among others, by two delegates from America sent by Abraham Lincoln and even won the sympathy of Napoleon the Third, though the French Minister of war, felt very hostile to Dunant's book.

In October 1863, the first conference was held in Geneva under the Presidentship of Moynier, with Dunant acting as Secretary. Next year, the Swiss Government issued an invitation to the conference and a code of International Rules on the basis of the first Geneva conference was drafted to help the sick and the wounded. When Prussia attacked Denmark, one of the workers called Dr. Appia, wore as an armlet a Red Cross, and thus gave its present name to the organization. There was one saddening feature, though the movement grew from strength to strength. The real founder of the movement, Henry Dunant, was relegated to the background, and it was Mr. Moynier who dominated the entire scene. Henri Dunant's business also suffered the worst fate.

In 1879, Henri Dunant appeared in the little village of Heiden as an eccentric old man with a long flowing beard. The village school master and his wife befriended him. The International Conference was to be held in Rome, and Dunant urged the schoolmaster to attend. But the plan failed as there was no money to defray the expenses of the journey. Dunant tried to raise some money but failed. What an irony of fate, a man rolling in wealth, failed to raise a paltry sum of money !

Failing to attend the conference, the schoolmaster wrote a letter, and invited the attention of the delegates to the miserable plight of the founder of this organization. The entire assembly was touched to the quick by the contents of this letter. It awarded

him the Nobel Prize in partnership with another person. Despite this honour, Dunant's mind could not recover itself from the agony of rude shocks received due to prolonged neglect. He passed the remaining eighteen years of his life in perfect serenity in a hospital, but he could not regain his former self. Even now he was so crazy as to find fault with the village school master himself who was responsible for the crowning glory of his life. It is, however, a good augury that the Red Cross Organization has kept its head above the dirty waters of party squabbles and factional rivalries. It has marched from strength to strength, never deviating even an inch, from its basic and lasting principle of, " we are all brothers."

Questions and Answers

Q 1. *"Why can not we make use of the noble rising heroisms of our own day instead of leaving them to rust."* ?

(F. Nightingale)

How far are the above words applicable to Henri Dunant's life ?

Ans :--The life of Henri Dunant aptly illustrates the truth of Florence Nightingale's remark. Gray too felt sympathy for those heroic spirits who were neglected and persecuted by their own fellow-brethren. Hence he sang in a prophetic manner;

"Full many a flower is born to blush unseen,
And waste its sweetness on the desert air."

Henri Dunant's life is a long record of the neglect and suffeings endured by him from the members of that very organization, of which he happened to be the founder. The day, he reached Solferino to meet Napoleon the Third, proved a turning point in his life. This enormously rich fellow, who had gone to the battle field to win some trade concessions from the emperor in the most glorious hour of his life, suddenly turned into a saviour of the mutilated and wounded soldiers. The entire field was strewn over with their bodies. The fountain of sympathy flowed forth from his heart like a torrent. In nursing the wounded and the invalids, he became utterly forgetful of his trade.

We know from Dunant'e life history that his interest in the organization, which he hnd founded, increased along with the passage of years. But a tide of adverse fortune came. Henri Dunant. the founder and the living spirit of the organization suffered neglect, and another man Moynier, dominated the entire

organization. For a decade and a half, the name of Henri Dunant was completely forgotten. No one knew anything of him; none recalled his services. The man had already lost his entire fortune, and the shock of continuous neglect made him almost crazy. "Misfortunes do not come singly but in battalions." There was none to rediscover this jewel of a man who had rendered yeoman's service to the organization. He had yet to pass his days in obscurity, until that fateful moment, when he chanced to reach the little alpine village of Heiden, and the village school master recognized in his wrinkled and worn out face, with a flowing white beard, the genius of the Red Cross Movement. Dunant exhorted him to go to Rome, where an International conference of the Organization was to be held. But this once rich man, who was granted audience by emperors and kings, had not money enough to defray the school master's travelling expenses to Rome. Therefore, the village schoolmaster addressed a letter to the delegates of the Conference, inviting their attention to the plight of the founder of this organization. The recognition of his services came at once in the form of the award of a Nobel Prize. But the years of neglect and oblivion had crushed the cheerful spirit of the man, and though he lived for eighteen years more, he never could re ain the freshness, the vigour and the inspiration of his earlier years. It was in this way that the noble heroism of this man was allowed to rust unused.

Q. 2. "*Horror, pity, the need of helping human suffering at its most dire, these thing took possession of him, broke the comfortable pattern of his life and built it anew in a symbol which to-day the whole world knows, the merciful symbol of the Red Cross.*" *(Horace Shipp)*

How far do these words form a fit tribule to Henri Dunant ?

Ans :—The very sight of the battlefield of Solferino, which was strewn with the dead and dying soldiers, melted Dunant's heart. It has been said, "Mercy is twice blessed, it blesseth him that gives and him that takes." This seed of mercy grew into a huge tree of wide and luxuriant growth. But its roots shook the foundations of the edifice of his life, for his business suffered a heavy crash. His mind was now engaged only with one problem, that of banishing wars, and rendering help to those who became its victims. His Algerian Company drifted towards bankruptcy and his shareholders grew uneasy. This ruin went

on speeding up its course, until Dunant was reduced to such straitened circumstances, that after a period of fifteen years, he had not even the money to meet the travelling expenses of Mr. Sonderegger, the village school master, of a journey from Heiden to Rome. Thus it is that the comfortable pattern of his life was broken to pieces. It is said that out of the ashes of phoenix arises another. Therefore, from the shattered fortunes of a millionaire, sprang up the Red Cross Organization which has been a source of hope and protection to the victims of war. The moth sacrifices itself on a flame out of sheer love, the seed rends itself into two so that the sapling may sprout. So did Henri Dunant sacrifice his riches at the altar of altruism and selfless service. His fame still walks the earth and to noble deeds gives birth. The Red cross Organization is still alive. The principle of giving protection in war to the personnel of military hospitals has been accepted, and the symbol of such protection is now the familiar Red-Cross on a white back ground. Rightly did G. Eliot say, "More helpful than all wisdom is one draught of simple human pity that will not forsake us."

Such draught of pity was administered by Dunant to the wounded and dying soldiers on the battlefield of Solferino.

Q 3. *Trace the history of the Red Cross Organization.*

Ans :—See the summary.

Q. 4. "*I am a disciple of Christ like those of the first century, that is all.*"

(*Henri Dunant*)

Explain the significance of the above statement.

Ans; The above words were once spoken by Henri Dunant to Sonderegger, the village school master of Heiden. He expressed an aversion to the various ceremonies which are held at one's funeral. Therefore he said to him, " I desire to be carried to the grave without any of your ceremonies which I do not acknowledge." I rely upon your friendship that it shall be done thus with me. I am a disciple of Christ like those of the first century, that is all."

Henri Dunant was very modest, when he declared himself only to be considered a disciple of Christ, and not at all as the founder and the father of the Red Cross Organization. Like Christ, he dedicated himself to the service of humanity with unflinching determination and unwavering will. The causes which he pursued ruined his fortune, yet he never turned his back. Thus, he served humanity like the disciples of Christ, never caring a bit for his personal welfare and comfort.

organization. For a decade and a half, the name of Henri Dunant was completely forgotten. No one knew anything of him; none recalled his services. The man had already lost his entire fortune, and the shock of continuous neglect made him almost crazy. "Misfortunes do not come singly but in battalions." There was none to rediscover this jewel of a man who had rendered yeoman's service to the organization. He had yet to pass his days in obscurity, until that fateful moment, when he chanced to reach the little alpine village of Heiden, and the village school master recognized in his wrinkled and worn out face, with a flowing white beard, the genius of the Red Cross Movement. Dunant exhorted him to go to Rome, where an International conference of the Organization was to be held. But this once rich man, who was granted audience by emperors and kings, had not money enough to defray the school master's travelling expenses to Rome. Therefore, the village schoolmaster addressed a letter to the delegates of the Conference, inviting their attention to the plight of the founder of this organization. The recognition of his services came at once in the form of the award of a Nobel Prize. But the years of neglect and oblivion had crushed the cheerful spirit of the man, and though he lived for eighteen years more, he never could re ain the freshness, the vigour and the inspiration of his earlier years. It was in this way that the noble heroism of this man was allowed to rust unused.

Q. 2. *"Horror, pity, the need of helping human suffering at its most dire, these thing took possession of him, broke the comfortable pattern of his life and built it anew in a symbol which to-day the whole world knows, the merciful symbol of the Red Cross." (Horace Shipp)*

How far do these words form a fit tribule to Henri Dunant ?

Ans :—The very sight of the battlefield of Solferino, which was strewn with the dead and dying soldiers, melted Dunant's heart. It has been said, "Mercy is twice blessed, it blesseth him that gives and him that takes." This seed of mercy grew into a huge tree of wide and luxuriant growth. But its roots shook the foundations of the edifice of his life, for his business suffered a heavy crash. His mind was now engaged only with one problem, that of banishing wars, and rendering help to those who became its victims. His Algerian Company drifted towards bankruptcy and his shareholders grew uneasy. This ruin went

on speeding up its course, until Dunant was reduced to such straitened circumstances, that after a period of fifteen years, he had not even the money to meet the travelling expenses of Mr. Sonderegger, the village school master, of a journey from Heiden to Rome. Thus it is that the comfortable pattern of his life was broken to pieces. It is said that out of the ashes of phoenix arises another. Therefore, from the shattered fortunes of a millionaire, sprang up the Red Cross Organization which has been a source of hope and protection to the victims of war. The moth sacrifices itself on a flame out of sheer love, the seed rends itself into two so that the sapling may sprout. So did Henri Dunant sacrifice his riches at the altar of altruism and selfless service. His fame still walks the earth and to noble deeds gives birth. The Red cross Organization is still alive. The principle of giving protection in war to the personnel of military hospitals has been accepted, and the symbol of such protection is now the familiar Red-Cross on a white back ground. Rightly did G. Eliot say, "More helpful than all wisdom is one draught of simple human pity that will not forsake us."

Such draught of pity was administered by Dunant to the wounded and dying soldiers on the battlefield of Solferino.

Q 3. *Trace the history of the Red Cross Organization.*

Ans :—See the summary.

Q. 4. "*I am a disciple of Christ like those of the first century, that is all.*"

(Henri Dunant)

Explain the significance of the above statement.

Ans; The above words were once spoken by Henri Dunant to Sonderegger, the village school master of Heiden. He expressed an aversion to the various ceremonies which are held at one's funeral. Therefore he said to him, " I desire to be carried to the grave without any of your ceremonies which I do not acknowledge." I rely upon your friendship that it shall be done thus with me. I am a disciple of Christ like those of the first century, that is all."

Henri Dunant was very modest, when he declared himself only to be considered a disciple of Christ, and not at all as the founder and the father of the Red Cross Organization. Like Christ, he dedicated himself to the service of humanity with unflinching determination and unwavering will. The causes which he pursued ruined his fortune, yet he never turned his back. Thus, he served humanity like the disciples of Christ, never caring a bit for his personal welfare and comfort.

Nations as Neighbours

Woodrow Wilson and the League of Nations

Main points:--

(1) Though the League of Nations has failed, yet the idea behind it must be kept alive.

(2) Tribute must be paid to Woodrow Wilson, who brought into being this ideal institution, as well as to Smuts who also played a worthy role in its making.

(3) After working in various capacities, Woodrow Wilson entered Politics.

(4) Both as Governor of New Jersey and as President, he introduced reforms, which dealt a heavy blow at financiers and business magnates.

(5) Wilson was a pacifist and his policy of isolation secured his re-election. In 1917, America was forced to participate in the war, because of the sinking of her ships.

(6) In Europe and America, idealists turned their thoughts to the creation of an agency which could banish war. Wilson advocated cooperation among nations to achieve this end.

(7) Some principles envisaging common and co-operative efforts were laid down in the form of Fourteen Points.

(8) The German Chancellor appealed to Wilson for peace. Peace conference was materialised in 1919. Wilson was the only dominating personality. As Wilson did not preside, the Peace Terms were very severe.

(9) Wilson tried to save the peace of the world through the League of Nations. The dream was realised, but ironically enough, America withdrew from it. This meant Wilson's political death.

(10) The League of Nations served the world for twenty years by preventing war through the settlement of nearly fifty international disputes.

(11) It performed valuable work in other fields as well.

(12) The underlying principle of the League of Nations still survives, and must prove triumphant once again.

Summary:--

The League of Nations came into being at the Peace Conference of 1919. It brought to humanity hopes of the termination of war. The Second World War and, other disastrous events

leading to it, disappointed those hopes. Despite this failure, the idea behind the League of Nations must be kept up, finding consolation in the fact that big tasks are rarely accomplished in the first attempt.

It may be hoped, if humanity tries again, the attempt to maintain peace will prove successful. It is also necessary to pay tribute to Wilson who fathered the entire plan, and to General Smuts whose Memorandum was also a part of the main principles of the League.

Thomas Woodrow Wilson was born in Virginia in 185}. He lived a successful life as a lawyer, college Professor, and the President of a University. After his last office, he entered politics, and became the Governor of New Jersey as a Democrat. A man of lofty idealism, as a Governor, he waged a ceaseless war against the big financiers in support of the poor. When he became President, he continued to fight for the poor against the rich. This made him very popular with some, but also created dreadful enemies who conspired his ruin.

He pursued ardently the policy of Pacifism. Therefore, for a few years his country did not join the First World War, and pursued a policy of firm isolation. It was this policy which secured his re-election. Later, due to the attack on American ships by the German submarines, the policy of isolation was abandoned, and America enlisted herself on the side of the Allies and joined the operations.

In Europe as well as in America, the minds of the people were seriously busy in planning an agency which would ensure world peace. Wilson was first opposed to this idea, but in May 1916, he declared himself in accord with the idea of "common understanding for a common object", and the need of co-operation and good neighbourly relations between countries. In 1918, his own country was drawn into the vortex of war, and Wilson proposed his Fourteen Points calculated to bring about the conclusion of the war. The events again registered a change. Russia withdrew from war and left the Allies alone. People did not yet lose heart, because they had faith in Wilson's honesty and love of justice. Germany realised the inevitability of her defeat, and appealed to America for an honourable peace.

Europe also took Wilson as its idol. He went there twice to attend the Peace Conference. England looked upon America as a good ally, because American participation in the war meant great

help and hope. Germany expected to be saved by Wilson from the vindictive French, and some small nations expected to maintain their sovereignty under the benevolent supervision of Wilson. But what took place at the Peace Conference was altogether different and disappointing. It was not Wilson, the champion of peace, who presided over the Conference, but Clemenceau whose heart was filled with the spirit of bitter vengeance against the Germans. Wilson's Fourteen Points, on which Germany relied for an honourable peace, were here and there thrown to the winds by Clemenceau, and he maltreated the President himself.

When Wilson found his dreams of the world peace shattered, he stuck to his Fourteen Points and envisaged a League of Nations, which not only received the whole hearted support of smaller nations, but also of such illustrious figures as Lord Robert Cecil and General Smuts. The latter published, "The League of Nations, a Practical suggestion", and drew up a Memorandum which was largely incorporated in the final Covenant.

Wilson presided over the Conference which was set up to draft a constitution for the League. There was a storm of controversy regarding its ideals and principles. France opined that Germany and other hostile countries should be kept out of the League; Japan's proposal to establish complete racial equality went unattended; Russians with their fads of the rule of the Proletariat were distrusted; and last of all America forced Wilson to reaffirm the old Monroe doctrine and pursue a policy of determined isolation.

On the 28th April, there came the hour of the President's victory, because the Covenant of the League received unanimous approval. Wilson's hope for World Peace solely rested on it. America refused to be its member and Wilson's political career ended in ignominy. But Smuts paid his tribute to Wilson as having created the 'Little child that shall lead them yet.'

The history of the achievements of the League presents a hopeful account. It setttled more than fifty international disputes, though in the end it failed to avert the Second World War. It did splendid work in other directions as well.

The main cause of the failure of the League was its inability to root out the idea of intense nationalism, and the idea of retaining the sovereign right of force. Therefore, gradually Europe, again "slipped back in to the national anarchy which the League was planned to prevent." Japan ravaged Manchuko; Italy invaded Albania and Abyssinia; Germany suffering from the harshness of the Versailles Treaty gradually asserted herself, and began to take law into her own hands.

The League of Nations might have perished, but the idea which animated its founders, still inspires humanity. "The League is dead long live the League."

Questions with Answers

Q. I. "*To Woodrow Wilson, the apparent failure, belongs the undying honour which will grow with the growing centuries, of having saved the little child that shall lead them yet. No other statesman but Wilson would have done it. And he did it.*" *(Smuts)* *Justify the above*

Ans:--"But to him who tries and fails and dies,
I give great honour and glory and tears."

Joa-Quin Miller.

The above lines are literally applicable to the American President, Thomas Woodrow Wilson, who is known as the father of the League of Nations. Mr. Smuts also, who praised Wilson highly for founding the League, shares the honour of having drafted a Memorandum of this important organization. As the Fates would have it, the League of Nations died while it was only a suckling. Since its very inception, it threw its weight on the side of the allies, and could not totally root out the feelings of aggressive nationalism that had been responsible for the havoc wrought by the First World War. Therefore, Wilson met with failure in this big undertaking, and within two decades the League became almost non-existent. The league is no more, but the glorious idealism which inspired its architects still survives, and fires the imagination of the people. In a world torn by war and national antipathies, it was the first organization of its kind which sowed the seeds of international cooperation and brother hood; and impressed upon the minds of the people the urgency of founding a new institution in its place which will prevent the possibility of a war. War brings in its wake devastation on an undreamt of scale, both to the victor and the vanquished. Such destruction was and, can only be avoided, through agencies like the League of Nations.

" The League is dead, long live the League." The spirit of this organization has again manifested itself in its modern successor, the U. N. O. Wilson's name, despite his failure is still uttered with a feeling of pride and exultation. Though his country refused to join the League of which he was the founder, yet his fame has increased by leaps and bounds as the mighty river of time has rolled on.

It was Mr. Wilson alone, who possessed necessary boldness, humanity and lofty idealism to found so good an organization. Wilson had a burning faith in the propagation and promotion of justice. When the German Chancellor foresaw a defeat, he made his appeal to Wilson for an armistice, because he was the man of the hour. He went twice to Europe to attend Peace Conferences, where he was accorded a very warm reception. People hailed and cheered him. The Allies considered him their saviour, because it was the aid given by him, which brought about their victory. To Germany, he was the only man who could rescue her from the clutches of the French. To Poland and Czechoslavakia, whom he promised an independent existence, he was the only man who mattered. Therefore, it was Wilson alone and none else, who could found such a mighty organization as the League. No other figure of his day commanded so much respect in his country, as well as abroad, to embark on an undertaking of global character.

Q. 2 "*We forget that the human sprit, the spirit of goodness and truth in the world, is still only an infant crying in the night and that the struggle with darkness is as yet mostly an unequal struggle.*"
Elucidate the above. *(Smuts)*

Ans. These words uttered pretty back by General Smuts about the unsuccessful working of The League of Nations ring true even in modern times. There has been going on a ceaseless struggle between good and evil forces not only in the soul of man, but in the outer world also. Just look at the evil of intense nationalism which was rampant after the First World War, and is still masquerading under other names. Look at the baseless suspicions, bitter jealousy and hatred which exist today between nation and nation. Goodness and truth which exsit in the world today are just a fraction of the evi which stares us in the face and tries to overpower the forces of light. Though there is no 'shooting war' yet 'cold war' is raging.

It is only the organizations like the League (Now defunct) and the U.N.O. with its branches that show a gleam of hope to the despairing masses who see nothing but darkness ahead. It is the sacred duty of each and every citizen to strengthen those forces, which are trying to save mankind from disaster, and render all possible help to these leaders who stand for

hese noble causes. Then and then alone can humanity be saved from the horror and atrocities of a third world war. There is no royal road to happiness. A period of millennium can only dawn, when the spirit of goodness and truth will be made to prevail over the forces of darkness.

Q 2 *Trace the growth of the League of Nations, and point out the part played by Wilson in its making.*

Ans Read the summary.

Q 3 "*It was not Wilson who failed but humanity itself. It was not the statesmen that failed* so *much as the spirit of the peoples behind them.*"

(General Smuts)

How far do you agree with this view ? Explain.

Ans. General Smuts, one of the founders of the League, is perfectly justified in attributing the failure of The League of Nations not to Wilson, but to mankind itself. Wilson's task came to an end when the League had been founded. It was for mankind as a whole to keep the torch burning which was handed over to it by Wilson. If they allowed it to extinguish, the fault is theirs and not of this veteran, who had toiled all his life in the service of the humanity. If the supporters and members of the League had been fired with the enthusiasm which filled Wilson's heart, they would have been successful in keeping this institution alive. By now it would have grown in to a very big institution with its branches spreading all over the world and embracing all kinds of activities which conduce to the welfare of human beings. But it is a matter of deep regret that nations could not sink their differences and could not bid good bye to the spirit of aggressive nationalism. Soon the members began to show signs of disruption and also started casting their covetous eyes on the territory of other countries. This was to strike at the very root of the League, the sole aim of which was to estalish stability security and peace on this globe. Why blame other countries! Even Wilson's own mother country refused to associate itself with the League. It was really a sad day when this decision was taken.

We are glad that today the spirit of the League of Nations has again manifested itself. The idea which was much cherished by Wilson has again become the most dominant idea of our age. We are striving after peace at all costs, the very peace for which the former League of Nations stood as a symbol. However it is not Wilson, who is to be blamed for its death, but the people of the world themselves, the erring mortals.

Having All Things Common

(Communism from Plato to Stalin)

Main Points:

(1) Communism is the most challenging idea in the modern times as seen in the Russian experiment.

(2) It is also an ancient idea. It can be found in all ages, in Plato, in the teachings of the Christian Church, in the monastic system of John Ball and in More's Utopia.

(3) The same idea can be traced in the lives and works of a few more people.

(4) In the nineteenth century, due to Industrial Revolution and keen competition, inequality increased and the life of the poor became more miserable.

(5) A team of idealists sprang up, who advocated social reforms, and thus modern socialism was born.

(6) Karl Marx propagated the idea of Communism in Germany through "The Rhenish Gazette" but it was suppressed. Therefore Karl Marx flew to Paris and thence to Brussels.

(7) Karl Marx met Engels in Paris, and the latter became his life long friend and faithful colleague.

(8) Engels and Marx published a Communist Manifesto in which they declared class struggle as the root cause of principal historical events.

(9) The year 1848 witnessed some sudden and violent revolutions in various parts of Europe, particularly in France and Germany, but they were completely suppressed.

(10) Both Marx and Engels came to London. Marx published the first part of his book Capital and the remaining two were brought out by Engles after his death.

(11) A revolution showed is head in Russia, and not in London, which was the most industrialized country.

(12) Lenin was at the head of revolutionaries in Russia and, at his bidding, the country withdrew from war.

(13) Communism was establis hed in full swing in Russia and all opposition was suppressed.

(14) Communism has thrown a challege to all countries. The solution lies in utilizing the good that exists in it and purging it of its evil.

Summary:—

Communism is the most challenging idea in the world of today. It can be traced back to Plato's times, and is found to exist in almosteach and every century, till we come to its modern foundersKarl Marx and Frederick Engels. Karl Marx was a German and started his career as a journalist, full of the revolutionary ideas of a full-blooded socialist. At twentyfour, he became the editor of the Rhenish Gazette at Cologna and made t his mouthpiece. The Government in Germany did not like its views and therefore suppressed the paper. Marx flew to Paris in order to escapearrest. There too, he edited a paper "Forward" which was banned, and he had to fly to Brussels this time.

Fortunately in Paris, he came across a young German Socialist, Friedrich Engels who was on his way to England to manage his father's cotton business. He sacrificed his life of ease and comfort for the sake of socialistic ideas, shared along with Marx. Marx was further fortunate in having a devoted wife, the daughter of a noble man, who willingly shared all his hardships.

In 1847, Marx and Engels collaborated in publishing a pamphlet 'The Communist Manifesto" in which they ascribed historical changes to class struggles between haves and have-nots or the poor and the rich. All big movements, all changes, all wars, all important events are due to class struggle in their view.

In 1848, there were outbursts of revolution at different places in Europe, particularly in France and Germany. Marx and Engels rushed to Germany to help the revolutionaries. Engels had associated himself with the Chartists in England, and hoped that Communism will surely succeed there as it was the most industrialized country. But nothing happened. The violence of the revolutinaries was suppressed ruthlessly by the State Governments. Therefore Marx and Engels again returned to London and Manchester respectively.

For a period of thirtyfour years, until his death in 1887, Marx lived with his wife, reading, writing, and propagating his theory of Communism. He had not only to fight hard against straitened circumstances, but also fell a victim to ill-health. He wrote his epochmaking book 'The Capital', but he published only the first volume, the next two were published by Engels after his death.

Ironical though it might seem, Communism did not find a fertile soil in an industrial country. It was in Russia, a country

of starving peasantry, groaning under the tyranny of the Czars, that the idea appealed to the masses under the leadership of Lenin. Lenin chose a life of self-sacrifice, though he was born of rich parents. For propagating revolutionary ideas, he was exiled to Siberia for a term of five years. At the expiry of the term, he again threw himself heart and soul in to the work and carried it on for a full period of sixteen years.

Lenin considered the First World War an event which was the direct result of class-struggle, and also a favourable time for stirring up revolt. He was then in Germany, and was allowed by the Germans to cross over to Russia, so that he might persuade the Russians to rebel against the Czars. Lenin's plan succeeded in 1917, and the Bolsheviks became the rulers of the country. The first thing that Lenin did was to make peace with Germany.

The communist regime started under very unfavourable conditions. There was famine as well as starvation in the country. Friends of the old order were trying hard to demolish the new set-up, but the people were bent on preserving their freedom. Therefore, all opposition in the country was crushed with an iron hand as was done at the time of the French Revolution, and the enemy knocking at the gate was also made to suffer a crushing defeat.

Lenin died in 1924, and Stalin succeeded him. The idea of, Communism was thus fully established over one fifth of the world where it still holds sway. There arose two antagonistic movements in Germany and Italy, called Nazism and Fascism, which were run on the oppressive lines of the Bolsheviks. These two "isms", however, met with failure. Russia was good enough to co-operate in the Second World war with the countries pitched against Germany and Italy.

To day Communism constitutes the most challenging experiment in the world. England and America, the two great democratic countries, are slowly drifting towards socialism. This is a period of trial and test for mankind. Should it not sift the good from the evil that lies in communism and pin its faith on the former, because the living, vital principle beneath it has been echoed and re-echoed in the course of past centuries.

Questions with Answers

Q. I. *Substantiate the claim that communism is an old as well as a new ideal.*

Ans:—Said Marx and Engels in the famous Communist Manifesto; "The theory of communism may be summed up in one sentence : Abolish all private property." It is in this form that communism has become the most challenging doctrine in the world today. As back as 1919, it established itself to the full in Russia under the able leadership and direction of Lenin and Stalin. The idea is again gradually spreading fast to every nook and corner of the world. It has already made itself a telling force in the new China that has been born; it is again agitating the minds of numerous Asians and making a strong appeal to them. Communism aims at equitable distribution of wealth, at abolishing capitalism, which comprises stored-up wealth in any form. This amassing of wealth provides a fit climate for exploiting the poor people and for further depriving them of their petty possessions. Communism means that the capital or wealth is owned in common. The entire wealth of a country belongs not to individuals privately, but to the State under whose protection all citizens live and grow. The idea appears to be quite new, but the spirit and essence of it can be traced back to hoary times.

"Neither", said any of them, "that ought of the things he possesses was his own: but they had all things common. And distribution was made unto every man according to his need," so said the Christian Church. The monastic system itself, a part and parcel of Christianity, was founded on the principle of limited communism. St. Francis preached it in the thirteenth century; John Ball in the fourteenth. Thomas More, a saint as well as statesman, expounded the same idea in his Utopia written in the sixteenth century. Even Plato in 4 B. C. expounded a similar theory in his celebrated book 'Republic'.

Also after the sixteenth century, there were the exponents of the Communist creed almost in each and every contury. In the times of Cromwell, Gerald Winstanley started a community of 'Diggers', and Mably in France in the eighteenth century threw his entire weight on the side of equality with the passionate vehemence of Rousseau whose disciple he was. Said he, "The state as universal owner will distribute to each citizen the possessions he needs." This theory as explained and propagated by him turned in to the mighty wave of the French Revolution. William Godwin too was one of its very ardent advocates. His approach was ethical. He wanted people to give up their selfish urge towards material possessions. He said that was the only wad for human beings to shed their vices and become good any virtuous citizens.

With the advent of the Industrial Revolution the hardships of the poor increased, and their conditions of living reached the depth of misery. Out of this soil of stark poverty was born the modern socialism. It had its enthusiastic supporters in rich idealist such as Shelley, the aristocratic poet of revolt; Robert Owen, the capitalist, fired by the thought of cooperation;Charles Kingsley, the novelist; and also John Ruskin and William Morris, the two famous prose writers. There are still more people who were born in the nineteenth century and were inspired with socialistic ideology.

Then came the two most outstanding figures in this school of thought, namely, Marx and Engels. They gave a new interpretation to all history. "The history of all human society, past and present has been the history of class struggles" they declared in their Communist Manifesto. From them the torch was handed over to Lenin and Stalin, and thence the flame lit up the hearts of the Russian workers and peasants, with the result that the entire country has a full blooded communist government.

From all this, one can safely conclude that communism is not only a modern doctrine, but an idea which existed even in old times. Therefore it is both old as well as new, however paradoxical it might appear.

Q. 2 "*When people speak of ideas that revolutionise society, they do but express the fact that within the old society the elements of a new one have been created, and that the dissolution of the old ideas keeps even pace with the dissolution of the old conditions of existence.*"

[*Karl Marx*

How far is the above an explanation of the origin and growth of Communism ?

Ans.—According to Horace Shipp, the idea of communism has been in existence since Plato's times, though it existed then only in a seed form. As the conditions of life underwent a change, it assumed larger dimensions and began to sway the minds of people. With the advent of the Industrial Revolution, conditions of life in Europe were materially transformed to an immeasurable degree. Wealth accumulated in the hands of a few, the rich grew richer and the poor became poorer. Hence the revolution that commenced was double-sided. It wanted to

wrest power and money from the rich, who were simply exploiting the poor for their own benefit. Secondly, it recommended that the wealth seized from the rich should be equaitably distributed by the State among all its citizens. We have seen from the history of communism that the seeds of this doctrine were present even in ancient times. The social, economic, and political conditions did not favour its violent growth, because there did not exist at that time an appalling inequality in the distribution of wealth. Moreover, the rich were charitable and benevolent and were always willing to part with their wealth in order to ameliorate the conditions of the poor A time came when the rich became not only the matters of wealth, but tyrannized over the poor and exploited them to the fullest possible degree. Therefore as the old conditions of existence underwent vast transformation, there commenced simultaneously the process of distintegration of old ideas and values of life. No power on earth could check the growth of communistic ideology, unless the conditions of existence were also changed. This is how Marx justified the growth of communistic ideology in the history of the world. According to him, therefore, Communism is a natural and inevitable corollary of the times where in conditions of existence, economic as well as social, were materially changed. It had its roots in the soil where in it grew. This is what is meant by Marx in the above quotation.

The Dream Beyond Nations

THE IDEA OF FEDERAL UNION

Main points:--

(1) Seven Years' War of Independence brought freedom to the Americans from the tyranny of the British.

(2) On the conclusion of this war in 1782, Washington, the hero of this freedom struggle, repaired to his country farm to live a life of peace.

(3) Soon after the war of Independence, there was a rift among the thirteen American States due to economic distress, boundary disputes, and tariff question.

(4) Due to this domestic strife, even the eminent personalities of the nation lost all hopes of the progress and prosperity of the country.

(5) Ultimately an idea of Federation emerged and a convention was called at Philadelphia to discuss its feasibility.

(6) Delegates from all the different States assembled, but they were all hesitant to compromise the independence of their respective States.

(7) It was Washington who once again broke the ice, and asked the members to search their hearts and be bold and fearless.

(8) It was after this clarion-call that wisdom and good sense dawned upon the delegates, who then drafted a Federal constitution, uniting all the States in one Union.

(9) This Federal Union of the U. S. A. now embraces four times the territory and forty times the people existing at the time of its formation.

Summary:--

In 1782, after seven years of warfare, England was compelled to grant independence to the thirteen American States. Washington, one of the heroic figures, who participated in this struggle, disliked kingship, an honour which his countrymen desired to bestow on him for his valiant services. But he preferred to retire to his farm, and live a quiet life away from the haunts of men. This speaks volumes for the man and brings to the forefront his qualities of nobility and simplicity as well as supreme spirit of self-sacrifice.

The tremendous sufferings undergone during the period of the Seven years' war were soon lost sight of, and the thirteen American States in place of maintaining friendly relations, began to drift from each other and reached the verge of enmity. Leaders of the country became very depressed and gloomy due to this deteriorating situation.

One of the reasons for this growing bitterness between the States was the depression in trade which followed in the wake of the War of Independence. The League of Friendsship had been born already, but it could not check the worsening state of affairs. The main reason was the Congress had neither money nor wielded any authority over the States. For lack of finance, even the Army had been demobilised and thus the Congress was reduced to a perfectly helpless state.

The tariff problem was another cause of contention among the States. The Congress failed to settle boundary disputes due to lack of requisite number of votes of the member States, the minimum of which was fixed at nine. Even law and order in the country had suffered a lot. Frequently, proceedings in the courts were interrupted and foiled by the friends of the accused who took law in to their own hands by intimidating the judges in broad daylight. Once the arsenal of the League in Massachusetts was invaded by one Mr. Shay, and neither the State itself could defend it, nor did it allow the troops of any other State to enter its borders being over--zealous of its territorial integrity.

When the affairs had reached such deplorable state, a Convention was called in 1786 to unite all the sovereign States into one Union. The cry was for a "Federation", and Hamilton's paper 'The Federalist' took up the task of popularising this idea among the people very strongly and earnestly.

In 1787, the Conference met in the historic hall where the Declaration of Independence was once signed. In the beginning, the Conference seemed to fail for want of quorum, but after a period of ten days nearly fifty delegates assembled. There was one more hurdle to be crossed. The delegates were afraid of relinquishing even a fraction of the sovereignty of their States, because the people would not welcome this compromise. When they were in this hesitating mood, there came a clarion-call from Washington Irving. He advised the delegates to shed their fears and doubts and plead boldly for a Federal State. These words were enough to turn the tables, and the Conference now sat for full hundred days, and framed the Federal Constitution which in furture established order where formerly only chaos reigned.

This experiment made by the Americans stands out to day as a challenge to the entire humanity. Can the nations of the world not unite under one banner and form a Federal government after the pattern of the United States of America. This dream may be turned into reality, provided it is pursued with ceaseless vigour and ardour. Let humanity bear in mind the following inspiring utterance of Thomas Paine, "we have it in our power to begin the world over again."

Questions with Answers

Q. 1. *Describe the condition of the American States subsequent to the War of Independence and prior to the birth of Federation.*

Ans:--It was in 1782 that England was forced to concede Independence to the American colonists after seven years of warfare. Washington Irving, who had played a dominant role in the War of Independence and brought it to a successful end, chose to lead a retired life at his farm. After the attainment of Independence, what remained for the thirteen States was to go ahead on the road to progress, peace, and prosperity. But unfortunately, this was not to take place.

Instead of drawing closer and forging ties of friendship, the thirteen States began to drift farther and farther. While at war with England, they could stand together and consolidate their strength, but after achieving victory they began to sow seeds of dissension. Each State had its own army, exchequer, its own laws, trades, and tariffs. Colonists spoke different languages and professed different religions. Therefore it was a sort of heterogeneous world with scanty hope of homogeneity. Thomas Paine felt very desperate at this deplorable state of affairs Peace and concord were not yet in sight. The country consisted. of people who had difficulties of language and of conflicting trade interests and were accustomed to different forms and habits of government, and possessed different habits and opposing sentiments. The union of such people appeared a wild and impracticable proposition. Another great mind of these times, Josiah Tucker also spoke in a similar dejected tone. He called union of America in to one Federation, "One of the idlest and most visionary notions that ever was conceived even by writers of romance." It was difficult to have a union because of their mutual rivalries and strifes. He feared the Americans will remain, "a disunited people till the end of time, suspicious and distrustful of each other, they will be divided and sub divided in to little commonwealths and principalities according to natural boundaries, by great bays of the sea and by vast rivers, lakes and ridges of mountains." Other American leaders also thought in this very desperate manner.

There existed the League of Friendship, the object of which was to hold the thirteen States together, but it failed to achieve its aim. Due to depression in trade, which was one of the several ruinous effects of the War of Independence, each State wanted to become prosperous at the cost of others. Disputes regarding inter-state boundaries were very frequent. Sometimes, there were threats of war too. The League of Friendship failed to save the worsening situation for lack of money and power. The army

was already disbanded, soon after the conclusion of war, due to the difficulty of finding sufficient money to meet its expenses.

Another cause of the disputes was the tariff question. Each State wanted to levy the maximum possible duty on the commodities which were exported and have the imports with the payment of minimum possible duty. The congress had the power to settle the boundary disputes, but it failed to function properly for want of securing at least nine votes at a time from the thirteen member States.

There also took place an attack on the arsenal of the League in Massachusetts. Due to such omious incidents, even Washington grew very apprehensive and gave expression to his feelings in the following manner. "I am uneasy and apprehensive. More so than at any time during the war." The contemporary historian Fiske also voiced his distrust at the existing order of things The whole atmosphere was full of disappointment and frustration. There was yet no ray of hope in sight.

Q. 2 *How did the Federal State of the United States of America come into existence ? Explain fully.*

Or

" *We have it in our power to begin the world over again.*"

[*Thomas Paine*]

How far the above utterance proved prophetic about the U. S. A.

Ans: Though the War of Independence had been won, the thirteen American States were bitterly pitched against one another. The chief cause of this lay in excessive economic distress which had raised its ugly head after the conclusion of the war. Inspite of the best efforts of the League of Friendship to promote better understanding and fellowship, the States only became more and more hostile to one another. This pricked sorely the hearts of all the great leaders of the country. Even Washington felt very morose and desperate at this deplorable state of affairs. Therefore he raised the cry of 'Federation'. It spread like wildfire from person to person and from village to village. Some newspapers also supported this idea, and carried on a vigorous campaign in its favour, the chief of them being Hamilton's paper 'The Federalist.'

Therefore in May 1787, a Conference was convened which met in Independence Hall in Philadelphia where the Declaration

of Independence had been signed. For ten days the Conference fought a losing battle, because even the quorum was not complete. But at last fifty five delegates arrived, among whom was Washington, the one man to whom all looked for advice and guidance.

There was still little hope of setting up a Federation. The delegates, afraid of displeasing the voters, still desired to keep the States independent of and aloof from one another. The representatives of the Southern States were seized with a greater desire for this. Even those patriotic souls who in the days of the War had declared," there were no Virginians or New Yorkers but only Americans" fought shy of reiterating their former belief. Washington, the man of destiny, came to their rescue. He knew what fear was invading the hearts of the delegates. Hence he said.

" If, to please the people, we offer what we ourselves disapprove, how can we afterwards defend our work ? Let us raise a standard to which the wise and the honest can repair. The event is in the hands of God."

These words tipped the scales in favour of peace and union. The delegates searched their hearts and sat in Conference for full hundred days. During this period, the Constitution of the Federal States was framed and one State after another ratified it. They sacrificed their individual rights to levy tariffs, to mint money, to make treaties, to keep their own army and navy. Under the Federal constitution, some matters of common concern were handed over to the Central Government for administration, while the member States were granted complete autonomy in their provincial and local matters. To-day that constitution governs four times as many States and forty times as many people as it did when it came in to existence. It had again to be fought for during the four terrible years of the Civil War. Today it stands as a challenge to the world. The world today is exactly in the same state of dissension and strife in which the American States were placed after the War of Independence. Is it possible for the nations to sink their differences of language, to forget diversity of their culture and traditions, and avert the impending danger of a third World War ? Shall we witness the dawn of that day, when every one can speak of the whole world, as Longfellow once sang of America !

Thou too, sailor, O ship of State !
Sail on, O Union, strong and great !
Humanity with all its fears !
With all the hopes of future years !
Is hanging breathless on thy fate !

If we are filled with the spirit of Thomas Paine's words, we can really expect 'One world' and proudly live as its citizens under one banner. When wisdom dawned upon the Americans, they united themselves under one Federal Government, and so the citizens of the world of today can do so, if they also acquire the wisdom and foresight of these old Americans.

Q. *And it still moves (E PUR SI MUOVE). In what manner do these words apply to our modern world ?*

Ans :—These words of Galileo, uttered silently when he was compelled to recant (to disavow) the truth he knew, apply to our modern world with great point and force. It is just possible, because of the wonderful scientific discoveries made so far by great minds, and the deep and extensive realms of knowledge explored by them, we may fall into a mood of complacency (self-satisfaction) and lethargy. When man entertains this feeling of having achieved all that he had to do, and puts a halt to progress, his downfall will also begin. If we thus cease our work and relinquish our post of duty, it will be nothing but a betrayal our trust. Let us always be moved by a feeling of having accomplished nothing, because our knowledge lies in knowing our own ignorance. In this mysterious world, there are yet so many riddles which the human mind has failed to solve so far. Therefore, we should not stop our pursuits and noble endeavours, never fall into a mood of sloth and self-satisfaction. The more we work, the happier will be our lot. Ulysses said,

"How dull it is to pause, to make an end,
To rust unburnished, not to shine in use !"

We should recall the sacrifices of men and women of the past. They sacrificed their comfort, peace of mind, joy, and their precious treasures for the benefit of mankind. It is because of their hard labour, the fruits of which we are still gathering, that we live in this comfortable manner. The challenge to each one of us is to carry their task further. It is just possible that if we become listless, the treasures of knowledge might be used for the destruction of mankind, as it has been already done in the course of this half century. Therefore, we have to be very cautious and watchful against this exploitation of knowledge made to subserve mean and ignoble ends.

Further, the spirit of interrogation and questioning must not remain unused in us. Let that flame rise again. Still we must question the old truths and try to explore and establish new ones. We have to bear persecution, poverty, misery, and scorn as did our predecessors for upholding the truth so discovered, if need be. We should not become so pessimistic and depressed as to think that human nature is incapable of any alteration. Let us believe there are no irreclaimable (not to be reformed) rascals or villains on the face of this earth. Our Father of the Nation believed in co version of the human heart. Let us tread in his footsteps and put into practice what he preached from the housetops. We should also bear in mind the following popular quatrain which can bear repetition once more.

"There is so much good in the worst of us,
And so much bad in the best of us
And it ill behoves any of us
To find fault with the rest of us."

Therefore the world still moves. Its process of evolution will continue as the ages roll by. We are the instruments of this evolution. It is natural that if the instruments are of a good metal, the evolving world will be good; if the instruments are perfect, the world too will be perfect Hence, we should also search our hearts and purge ourselves of the evil that is in us, so that, misery, inhumanity and poverty may be wiped out from this world for good and a millennium may dawn.

General Questions with Answers.

Q I. *Prove, how far do you consider, 'Ideas That Moved The World', to be a story book of the dreams and the deeds of different people.*

Ans. 'Ideas That Moved The World' consists of nineteen chapters, each one of which deals with the dreams and the deeds of a number of people. From the very first page to the last, it relates how a certain miraculous discovery was only a dream at the initial stage. Because of the unflinching determination and arduous pursuit of the dreamer, the vision was translated into reality and became a glorious deed. One person inspired another and thus mankind moved onward from goal to goal.

When one reads the harrowing details of the difficulties that Copernicus, Bruno and Galileo had to face in establishing their new theory of the revolutions of the heavenly bodies, we are just amazed at their fortitude. They suffered persecution very

calmly and cheerfully, and ultimately established the truth for which they had strived. It was after a long struggle that the Ptolemaic theory was discarded and replaced by the Copernican.

Then we come across the noble deeds of Newton, a genius in the field of science. He is known to the present day by virtue of his three revolutionary discoveries : the laws of optics and the composition of light, the laws of dynamics and of gravity ; and the method of differential calculus which made exact measurement of speed possible at a later date. He also invented a telescope which is quite similar to the modern one.

It was William Harvey, who by his noble speculation and experiments, laid the foundations of the modern physiology. He made his mark by proving to the full that veins carried blood to the heart through the lungs and from the heart it was pumped into the arteries and sent around the body again. Thus he proved the theory of the circulation of blood, and overthrew the knowledge held by mankind for two thousand years. The mob repaid him for this discovery by breaking into his house, and destroyed the precious fruits of many years of his toil.

The father of modern chemistry, A. Lavoisier, not only invented the terms 'hydrogen' and 'oxygen', but also introduced exactness into chemical experiments. He proved to the hilt that matter is indestructible. This brilliant scientist who was also a very charitable fellow at heart, was sent to the gallows by Marat; the judge Coppinal also declaring, "The Republic has no need of scholars." This is how his contemporaries treated him and killed him for discovering the truth which proved unpleasant to them.

Then came the wave of Evangelical Revival which introduced sweeping reforms in the field of religion. The pioneer of this movement was John Wesley. He exalted and upheld the principles of Christianity, which had been debased by the cruel misdeeds of the fanatics. He took to 'field preaching' and tried his utmost to make every man and woman a symbol of goodness and self-discipline. He succeeded to a very great extent in his efforts, so much so, that Horace Shipp has the following words of praise for him. Says he, "If ever the dreams and deeds of one man wrought a change in his generation, those of John Wesley did in the life of the eighteenth century." It is a sad commentary on the short-sightedness of humanity that his own fellow beings failed to understand him and, instead of

rewarding him, either stoned him mercilessly or dragged him on the pavements and highroads. But this valiant spirit never abandoned his missionary zeal.

Common people had been denied freedom, equality, and democracy until Jean Jacques Rousseau filled them with courage to utter their thoughts and grievances. The privileged classes had never shrunk from oppressing and exploiting the lower classes. They harvested their pleasures from the toil and drudgery of the poor. But Rousseau tried to put an end to all this by writing his book "Contract Social", in which he expounded his ideas of having as little government and as few laws as possible and also that of installing the common man in authority. The idea of the 'Rights of Man' and of the equality of all human beings was thus firmly established by Rousseau. But Rousseau did not take entire mankind into consideration, as he had left out the whole race of women, who were still treated as mere chattels and instruments of catering to the fleshly passions of men and their capricious desires. The weaker sex thus needed a champion, and this was found in Mary Wollstonecraft. None before her had ever championed the cause of down-trodden women. She started this work at an early age, and sacrified all her comfort and riches for accomplishing this aim. She gave expressionto her ideas in her book "Thoughts on the Education of Daughters", which embodied a challenge to the conservative and orthodox opinion on the treatment of fair sex. She pleaded strongly for the liberty of women. As woman was a human being, she had every right to develop herself equally with man. This fight for the rights of women further expanded into other organizations and societies, like 'suffragists' movement' 'Feminism' so on and so forth.

Rousseau's vindication of the rights of man did not rid, humanity of vermins who still sucked the blood of the poor and turned the labour of others to their own use. Thes workers were still oppressed by the employers who denied them their due wages and kept them always on starvation level. When they demanded better wages, and organized themselves in order to have their grievances redressed, they were assailed both by their masters as well as the government officials. There was a new horror, that of unemployment, due to the rapid growth of machine-age. In one case when a few people organized themselves into a trade union, they were tried for binding themselves secretly with oaths; and were consequently sentenced

to seven years' transportaion. But due to the agitation of the workers for two continuous years, the suffering men were pardoned, and their right to form trade unions legally established.

Then came the startling theories of Darwin, Wallace, and Huxley, who propounded the evolutionary theory and denied the creation of the world as expounded in the Bible. In 'The origin of species', Darwin established that numberless forms of life had come into existence in the course of millions of years, and only the fittest species had survived; the rest had become extinct in the struggle for existence. In his second book 'The Descent of Man,' Darwin boldly associated our origin with some common ancestor and the great apes. Thus the sensibilities of people received a very rude shock, when they were allied to apes, and their origin and growth were accounted for by a physical and natural process.

So far we have the stories of heroic and nob'e deeds of great men; what follows later are the dreams gradually realised and ultimately translated into reality.

First in this category is the dream of mankind to rid itself of diseases by tracing their causes. A landmark in this direction was made by Pasture and Koch, who discovered mircobes as the cause of various diseases. This was no doubt a dream at the initial stage, but later on when it attained fruition, it became a deed. People had made conjectures about the cause of diseases as due to minute particles, even prior to Pasture. His achievement was that he gave to it a definite scientific form after labourious experiments. Lister and Semmelweis further added to the contribution to knowledge made by Pasteur and Koch. They made surgical operations quite safe by ruling out the possibility of their turning out gangrenous or septic. It was done by erecting the barrier of carbolic acid between the wound and the infected air. There is no doubt that a clue to this discovery was furnished by Pasteur's investigation.

It had been a problem to humanity to convey messages across long-distances. Crude devices for this purpose were adopted from time to time, until this dream of humanity resulted in the invention of the telegraph by Samuel Morse. Before the invention of the telegraph, drum taps, smoke signals, beacon-fires, semaphore signals, sails of windmills were used for the purpose of conveying messages, but the real success in this direction came only with the invention of the telegraph. If it was possible now to send signals round the world, there was still the problem of conveying voice across long distances, so as to make verbal communication possible. It was Alexander Bell

who achieved success in his plans and invented the telephone. A number of people had played with the idea of conveying voice to distant places; they were Helmholtz, Charles Wheatstone, Philip Reis and a few others, but the palm was won by Alexander Bell because of his discovery of the telephone. The miracle of radio was due to the successive endeavours of Maxwell, Hertz, and Marconi. What was a dream to the first two, became a living reality to the third, due to his arduous and persistent efforts. What a great service has been rendered by the wireless to the struggling mankind is an open secret which needs no recounting and recital.

It was the dream of mankind to fly in the air like birds. We hear of such efforts even in classical legends, and then various experiments to realise this dream were made by a number of people in different ages. For example, Roger Bacon, Albert of Saxony, Leonardo da Vinci and various others made vigorous attempts in order to succeed in flying in the air, until in the eighteenth century, balloons were tried for this purpose. This dream was ultimately accomplished through the valiant and heroic efforts of the Wright Brothers. The conquest of the air is the fruit of their labours.

Nations as neighbours, a dream which had been cherished for centuries, was translated into reality due to the heroic efforts of Woodrow Wilson. Humanity is deeply indebted to him. The dream beyond nations, that of one mankind, one world, one brotherhood is a step beyond it. We have yet to see the birth of a heroic soul, who by his sacrifice, labour and unflagging energy, will succeed in making the world a safe and happy home for the entire mankind, wherein the artificial boundaries between nation and nation will become a thing of the past and be forgotten. Similarly, since Plato's times, it had been the dream of mankind to have all things in common, and distribute wealth equally to all. This dream has been translated into reality in a few countries, and others are aspiring for and striving after similar ideals.

This is, in short, a review of the various deeds and dreams which have been related by the author in this book. The world still moves; the universe is still capable of new developments, new discoveries, and new inventions. We still need men, who will stand rock like against retrogressive and reactionary elements and tendencies, and lead the world further on the road to progress. Let the ideal of mankind be,

'From well to better, daily self-surpassed.'

N B. Hindi supplement to follow.

विचार जिन्होंने दुनिया हिलादी

१. यह सूझ कि पृथ्वी घूमती है : कोपरनिकस ब्रूनो और गैलिलियो

कोपरनिकस, प्रसिद्ध पुस्तक—अबसे कोई चार सौ वर्ष पहले २४ मई, १५४३ को पोलेंड के फ्रौएनवर्ग गिरजाघर में एक ७० वर्ष बुड्ढा पादरी अपनी अन्तिम घड़ियाँ गिन रहा था। उसकी शैय्या के चारों ओर उसके मित्र और प्रशंसक एकत्र थे। बुड्ढा पादरी होने के साथ-साथ डाक्टर, वकील, वैज्ञानिक, गणितज्ञ और ज्योतिषी भी था। उसकी खाट के चारों ओर खड़े हुए लोग एक पुस्तक के आने की बाट देख रहे थे। इस पुस्तक को न्यूरेम्बर्ग के एक छापेखाने से औसिएण्डर नाम का एक आदमी ला रहा था।

बुड्ढे पादरी ने इस महान पुस्तक को कोई तीस वर्ष पहले लिख लिया था। लेकिन वह इसे प्रकाशित कराने में बराबर हिचकता रहा। वह जानता था कि पुस्तक में लिखी हुई बातों को प्रकाशित करने का मतलब होगा पिछले डेढ़ हजार वर्षों से चली आई लोक-मान्यताओं को चुनौती देना और धर्म के दावेदारों से बैर मोल लेना। ऐसी पुस्तक लिखने पर उसे जेल, यातना और मृत्यु दण्ड भी मिल सकता था। इसलिये वह अभी तक इस पुस्तक को प्रकाशित कराने में हिचकता रहा था।

इस बीच में वह इस पुस्तक पर बराबर परिश्रम करता रहा। उसने लगातार वर्षों तक नक्षत्रों की गतिविधि का निरीक्षण किया; लम्बे-लम्बे हिसाब लगाये; कभी-कभी किसी मित्र से इस नये भेद की चर्चा भी की कि पृथ्वी और दूसरे नक्षत्र सूर्य के चारों ओर घूमते हैं। लेकिन उसकी इस बात पर लोग हँसते थे, उसकी मज़ाक उड़ाते थे। उस समय तक लोगों का खयाल था कि पृथ्वी स्थिर है और उसके चारों ओर सूर्य और दूसरे नक्षत्र घूमते रहते हैं। आँखों से सूरज घूमता दिखाई देता था; अरस्तू और टौलेमी ने

सैकड़ों वर्ष पहले यही बात कही थी; बाईबिल में यही लिखा था; और सबसे बड़ी बात तो यह थी कि धर्माधिकारी मानते थे कि पृथ्वी विश्व के बीचों-बीच ईश्वर ने खास तौर से मनुष्य के लिये बनाई थी।

बहुत पहले, एक बार कोपरनिकस ने अपनी नई खोज की कुछ चर्चा की थी। पोप लियो दसवें को सुनकर कुछ कौतूहल हुआ। कुछ समय तक उनकी सभा में लोग इस विषय पर बात चीत करते रहे। लेकिन किसी ने इसको कोई महत्त्व नहीं दिया। कभी-कभी किसी ने यह भी राय दी कि लोगों के मनोविनोद के लिये ऐसी बातें कहने में कोई हानि भी नहीं है।

और उस दिन, जबकि ७० वर्ष का बुड्ढा पादरी, कोपरनिकस, अपनी अन्तिम घड़ियाँ गिन रहा था, वह महान पुस्तक ओसिएण्डर द्वारा न्यूरेम्बर्ग में प्रकाशित होकर उसके पास आ रही थी। उसने पुस्तक उत्सुकता से हाथ में ली, उसके मुख-पृष्ठ पर लिखे हुए शब्दों "आकाश के नक्षत्रों और नगरों के विषय में" को संतोष के साथ पढ़ा और फिर सदा के लिये अपनी आँखें बन्द करलीं।

इस तरह, यह महान सत्य, कि सूरज नहीं, पृथ्वी और दूसरे नक्षत्र घूमते हैं—अब से चार सौ वर्ष पहले दुनियाँ के सामने आया।

कोपरनिकस से पहले—आजकल हमें यह जानकर बड़ा अचम्भा होता है कि अबसे चार सौ वर्ष पहले तक लोग इस सीधी-सी बात को नहीं जानते थे कि सूरज नहीं, पृथ्वी घूमती है। प्राचीन यूनान में अफलातून जैसे कुछ लोगों को शायद इसका पता हो। लेकिन मध्यकालीन अन्धयुग में और बातों के साथ-साथ लोग इस बात को भी भूल गये। ईसा की दूसरी सदी में अलैकजैन्ड्रिया के टॉलेमी नामक विद्वान ने तत्कालीन विचारधारा के अनुसार खगोल शास्त्र पर एक पुस्तक लिखी। अगले तेरह सौ वर्षों तक टॉलेमी की यह पुस्तक सर्वमान्य रही। इसके अनुसार पृथ्वी ब्रह्माण्ड के बीच में स्थित थी और उसके चारों ओर सूर्य और दूसरे नक्षत्र घूम रहे थे।

कोपरनिकस का जीवन-चरित्र—इसके बाद, पन्द्रहवीं सदी में पोलेण्ड के थार्न नामक स्थान में कोपरनिकस का जन्म हुआ। यह नये-नये विचारों और नई-नई सूझों का युग था। स्वयं कोपरनिकस इस युग के अग्रदूतों

में था। उसने क्रैको, बोलोना और इटली के पाडुआ विश्वविद्यालय में एक के बाद दूसरे विषय का गम्भीर अध्ययन किया। सबसे अधिक रुचि उसकी खगोल शास्त्र में थी। उसने सोचा कहीं यह पृथ्वी तो लट्टू की तरह अपनी धुरी पर नहीं घूमती। लोग उसके इस विचार पर हँसते थे। लेकिन उसने ऐसी बातों की कुछ परवाह न की और अपने प्रयोग करता रहा। ३९ वर्ष की अवस्था में उसने अपनी प्रसिद्ध पुस्तक—जिसमें उसने सिद्ध किया कि सूरज नहीं, पृथ्वी घूमती है—तैयार कर ली। यह पुस्तक अगले ३० वर्षों तक अप्रकाशित पड़ी रही। अन्त में, उसकी मृत्यु से कुछ ही पहले यह पुस्तक प्रकाशित हुई और स्पष्ट शब्दों में यह घोषित हो गया कि पृथ्वी घूमती है।

ब्रूनो का वृत्तान्त—कोपरनिकस की मृत्यु से सात वर्ष बाद ब्रूनो का जन्म नैपल्स में हुआ। ब्रूनो भी कोपरनिकस की तरह पादरी था। २४ वर्ष की अवस्था में वह अपने विचारों के कारण दण्ड के भय से भाग निकला। रोम, वेनिस, पाडुआ, जिनेवा, पेरिस, आक्सफोर्ड, विटेनबर्ग, फ्रैंकफर्ट होता हुआ वह फिर वेनिस लौटा। वह जहाँ जाता वहाँ अपने नये विचारों की घोषणा करता। चर्च के अधिकारी इन विचारों से बड़े रुष्ट हुए। ब्रूनो साफ कहता था कि मनुष्य सृष्टि का केन्द्र नहीं, अनन्त ब्रह्माण्डों में से एक के खण्ड का एक छोटा सा अंश है। इस नई घोषणा ने मनुष्य की सारी गरिमा घटा दी। मनुष्य अभी तक सृष्टि का स्वामी और केन्द्र माना जाता था; उसका गौरव था। ब्रूनो ने बताया कि ब्रह्माण्ड में मनुष्य नगण्य है। इस कठोर सत्य को घोषित करने के अपराध में चर्च की अदालत ने ब्रूनो को बन्दी कर लिया। छः वर्ष तक वह रोम की जेलों की कालकोठरियों में बन्द रखा गया। उसे तरह-तरह की यातनाएँ दी गईं; उससे कहलवाने की कोशिश की गई कि जिन बातों को वह पहले कहता था वे झूँठी थीं। लेकिन वह अपने विश्वास पर अटल रहा। अन्त में, १९ फरवरी १६०० ई० को उसे मृत्यु-दण्ड दे दिया गया। अन्त समय उसने कहा—मैंने अंध-विश्वासों और रूढ़िगत धारणाओं से लड़ाई लड़ी है। यह बहुत है—विजय भाग्य के हाथों में है। कुछ भी हो जीते कोई भी, लेकिन आने वाले युग इतना अवश्य कहेंगे कि मैं मरने से नहीं डरा, न मैंने हार मानी और मैंने कायर जीवन से जोशीली मृत्यु अच्छी समझी।

इन शब्दों के साथ ब्रूनो ने खगोल शास्त्र के लिये अपने प्राण दिये। जिस सत्य की कोपरनिकस ने घोषणा की थी उसी सत्य के लिये ब्रूनो जीवन भर यातनाएँ सहता रहा और खुशी-से मृत्यु को गले लगाया।

लेकिन यातनाओं और मृत्यु-दण्डों से कहीं सत्य थोड़े ही छिपता है।

गैलिलियो की कहानी—ब्रूनो के बाद गैलिलियो ने इसी सत्य को दुहराया। जब गैलिलियो ने ब्रूनो की मृत्यु का हाल सुना तो वह कुछ घबड़ा गया। लेकिन जब, १६०८ में, दूरदर्शक यन्त्र बन कर तैयार हो गया तो गैलिलियो ने जाँच-पड़ताल फिर जारी कर दी। चर्च ने दूरदर्शक यन्त्र को शैतान का खेल ठहराया और इसका प्रयोग बन्द करने का आदेश दिया। लेकिन गैलिलियो ने इसकी कुछ परवाह न की। कोपरनिकस ने बताया था कि शुक्र तारे की, चंद्रमा की तरह कलाएँ हैं और गैलिलियो ने दूरदर्शक की सहायता से यह देख लिया। सूर्य के धब्बों के अध्ययन से उसे मालूम हुआ कि सूर्य भी घूमता है। उसने बृहस्पति के खण्डों और हजारों दूसरे आश्चर्यों को दूरदर्शक द्वारा देखा।

१६१६ ई० में उस पर अपराध लगाया गया कि वह कोपरनिकस की बनाई हुई झूँठी बातों को मानता और उनका प्रचार करता है। कुछ समय के लिये गैलिलियो ने स्वीकार कर लिया कि वह ऐसी बातों का प्रचार न करेगा। लेकिन, थोड़े दिनों बाद, उसने फिर वही बातें कहनी आरम्भ कर दीं। दण्ड-स्वरूप उसकी भी वही दशा हुई जो ब्रूनो की हुई थी। नौ वर्ष तक, अंधा और असहाय, वह जेल में पड़ा रहा और अन्त में मर गया।

इस तरह संसार में सत्य आगे बढ़ता रहा है। एक के बाद दूसरा सत्यनिष्ठ यातनाएँ सहने और अपने प्राण देने के लिए तैयार रहता है और अन्त में केवल सत्य की ही विजय होती है। यातनाएँ, जेल और मृत्यु-दण्ड कुछ समय के लिये भले ही डरा लें अन्तिम विजय सत्य ही की होती है। गैलिलियो के बाद, कुछ समय के लिये, टाइको, ब्राही आदि लोगों ने फिर पुरानी रूढ़ी-वादी बातों को दुहराया। लेकिन, सत्रहवीं सदी में कैपलर ने संशय करने वालों का अन्तिम समाधान कर दिया और यह सदा के लिये सिद्ध हो गया कि पृथ्वी घूमती है।

२. गणित का जादू : आइज़क न्यूटन की सूझ

हम में से अधिकतर लोग न्यूटन के बारे में जानते हैं कि उन्होंने बाग में पेड़ से एक सेब को धरती पर गिरते हुए देख कर आकर्षण का सिद्धान्त खोज निकाला। लेकिन इस छोटी-सी बात से उनके अद्भुत मस्तिष्क की बहुत थोड़ी झलक मिलती है। उनकी खोजों ने अन्धयुग का अन्त कर आधुनिक वैज्ञानिक युग का आरम्भ किया। उनकी प्रतिभा ने नई-नई मशीनों के आविष्कार के लिये मार्ग प्रशस्त किया। और सबसे अद्भुत बात तो यह है, कि इन सब अद्भुत खोजों से अन्त में उनका मन फिर गया और अपने जीवन का उत्तरार्ध उन्होंने बाइबिल में वर्णित कालावधि का अध्ययन करने में बिताया।

बचपन में आइज़क न्यूटन कुछ अनोखे-से थे। वे स्कूल के साथियों से सदा अलग रहते और अपनी कक्षा के पिछड़े हुए विद्यार्थियों में गिने जाते थे। लेकिन, उन दिनों भी उनमें एकाग्रता का गुण था। वे अगर किसी गुत्थी सुलझाने में लग जाते तो और सब कुछ भूल जाते थे। उन्होंने थोड़ी-ही आयु में गणित के प्रसिद्ध सिद्धान्तों को खोज निकाला। लेकिन इन सिद्धान्तों को प्रकाशित करने की ओर उन्होंने कभी ध्यान नहीं दिया। आकर्षण सिद्धान्त सम्बन्धी उनकी प्रसिद्ध पुस्तक उनके एक मित्र ने बड़े आग्रह से प्रकाशित कराई।

आइज़क न्यूटन का जन्म १६४२ में—जिस वर्ष गैलिलियो की मृत्यु हुई—हुआ। न्यूटन भी उन्हीं समस्याओं के अध्ययन में लग गये जिनकी जाँच पड़ताल में गैलिलियो ने अपना जीवन लगाया। न्यूटन को यह जानने की बड़ी अभिलाषा हुई कि चीजें किस शक्ति से चलती हैं। टेढ़े तरन्ते पर गेंद क्यों ढुलकती है? नावों के मस्तूलों में हवा भर कर उन्हें कैसे चलाती है? नक्षत्र सूर्य के चारों ओर क्यों घूमते हैं?

न्यूटन के बचपन की अनेक कहानियाँ प्रसिद्ध हैं। उन्हें पतंगे उड़ाने और तरह-तरह की चक्कियाँ बनाने का शौक था। इन भोंड़ी मशीनों द्वारा वे धीरे-धीरे गणित के सिद्धान्तों की ओर बढ़ रहे थे। कहते हैं, स्कूल में वे मन्द-

बुद्धि छात्रों में गिने जाते थे और किसी बात में उनका मन लगता नहीं दिखाई देता था।

बीस वर्ष की आयु में वे गणित के गहन सिद्धान्तों की खोज में लग गये। १६६४ में उन्होंने प्रकाश-किरणों पर अपना प्रसिद्ध प्रयोग किया। उन्होंने अपने कमरे की खिड़की के एक छेद में होकर प्रकाश की एक किरण आने दी और उसे सात रंगों में विभक्त किया। फिर इन सात रंगों को मिला कर सफेद रंग बनाया। इस तरह उन्होंने प्रकाश के रंगों की खोज की।

अगले वर्ष उन्होंने आकर्षण के महत्त्वपूर्ण सिद्धान्त का पता किया और उनकी प्रसिद्धि दूर-दूर तक फैल गई।

आकर्षण के सिद्धान्त की कुछ थोड़ी-सी झलक गैलिलियो को भी मिली थी। लेकिन, सबसे पहले न्यूटन ने इसका ठीक-ठीक पता लगाया और गणित से स्पष्ट गुर स्थिर किए। न्यूटन की महत्ता इसमें है कि वे प्रकृति के प्रत्येक कार्य और व्यापार को काँटे में तोलना नापना चाहते थे। उनके स्थिर किए हुए गणित के सिद्धान्तों ने अगली सदियों की वैज्ञानिक उन्नति में बड़ा योग दिया। न्यूटन से पहले कल्पना और अटकल का ज़माना था; उनके बाद वैज्ञानिक नाप-जोख का युग आरम्भ हुआ।

न्यूटन ने ही पहले-पहल Differential Calculus का अनुसंधान किया। इसके द्वारा उन चीज़ों की नाप भी संभव हो गई जिन्हें लोग पहले अगण्य और नाप से बाहर समझते थे। गैलीलियो के दूरदर्शक से भी अच्छा एक दूरदर्शक न्यूटन ने बनाया।

इस तरह बीस से लेकर तेईस वर्ष की आयु तक—केवल तीन वर्ष में—उन्होंने कई महान अन्वेषण कर लिये। लेकिन, इन अन्वेषणों को प्रकाशित करने में उनकी कोई रुचि नहीं थी। कोई बीस वर्ष बाद, सन् १६८७ में, उनके एक खगोलज्ञ मित्र, हैली, उनसे एक दिन मिलने आये। बातों ही बातों में न्यूटन ने अपनी एक पाण्डुलिपि उन्हें दिखलाई। इसमें उनके प्रसिद्ध सिद्धान्तों का विवरण था। इन मित्र ने अपना धन लगाकर उस पाण्डुलिपि को प्रकाशित कराया जो Principia के नाम से प्रसिद्ध हुई।

अपने जीवन के अंतिम ४० वर्ष न्यूटन ने इधर-उधर की बातों में

बिताये। आश्चर्य की बात है कि उन्होंने अपनी प्रतिभा के महत्व की ओर ध्यान न दिया और इतनी बड़ी-बड़ी खोजें करने के बाद भी वे इधर-उधर की बातों में लगे रहे।

न्यूटन की एक प्रसिद्ध उक्ति है, 'मैं तो समुद्र के किनारे सीपियों और गुटकों से खेलने वाले बालक के समान हूँ। कभी-कभी मुझे कोई चमकीली और सुन्दर सीपी मिल जाती है। लेकिन सत्य का निस्सीम सागर अब भी मेरे सामने अज्ञात फैला हुआ है।"

———

३. शरीर विज्ञान की नींव : विलियम हार्वे की सूझ

विज्ञान की उन्नति में सत्रहवीं सदी का महत्व सबसे अधिक है। विज्ञान का आधुनिक युग इसी समय आरंभ हुआ। इसी समय लोगों ने अन्ध विश्वास रूढ़िगत मान्यताओं को सदा के लिये छोड़ दिया और अनेक दिशाओं में नई-नई बातें खोज निकालीं।

इस सदी की मुख्य घटनाओं में एक यह भी थी कि लन्दन के कुछ उत्साही युवक डा० गोडार्ड नाम के एक सज्जन के घर विज्ञान-चर्चा के लिये मिलने-जुलने लगे। ये लोग प्रत्येक सप्ताह नियत समय पर अपनी सभा करते और अपनी-अपनी खोजों को प्रगट करते थे। १६६२ में चार्ल्स द्वितीय ने इन लोगों को रायल चार्टर दे दिया और इस तरह प्रसिद्ध रायल सोसाइटी की नींव पड़ी। इस सोसाइटी के सदस्यों में डाक्टर, निर्माता, गणितज्ञ, मशीन बनाने वाले, वैज्ञानिक सभी थे। यह तरह-तरह के विचारों को एकत्र करने और प्रचार करने का बड़ा सुलभ साधन बन गई। सोसाइटी सदस्यों की नई नई खोजों को प्रकाशित करती थी और इस तरह दूसरे लोगों को भी पता लगता कि कहां कौन किस नई बात की खोज में लगा है।

विलियम हार्वे इसी युग में पैदा हुआ। रायल सोसाइटी के तत्वावधान में ही उसने शरीर-विज्ञान की यह महान खोज की कि शरीर में रक्त हृदय और फैफड़ों में होकर आता-जाता रहता है।

हार्वे ने पहले-पहले कैम्ब्रिज विश्वविद्यालय में अध्ययन किया। फिर वह इटली की पाडुआ यूनिवर्सिटी में गया। वहां के विद्वान डाक्टर

विसौलियस और फैब्रिसियस ने रक्त–संचार के विषय में कुछ–कुछ जानकारी करली थी। उन्हें कुछ--कुछ पता लग गया था कि शरीर की शिराओं में छोटे-छोटे दरवाजे से, कुछ वाल्व होते हैं जिनका मुंह एक ओर ही खुलता है।

इटली से लौट कर हार्वे ने अपने नये विचारों की जांच-पड़ताल आरंभ कर दी। १६१५ में उन्हें College of Physicians में प्राध्यापक का काम भी मिल गया। अगले वर्ष उन्होंने एक भाषण में अपनी रक्त-संचार सम्बन्धी नयी खोज घोषित की।

उस दृश्य की कल्पना की जा सकती है। एक अपराधी का शव, जिसे पिछले दिन फाँसी दी गई थी, मेज पर पड़ा था। दोनों ओर शव चीरने के लिये डाक्टर खड़े थे और मेज के पीछे खड़े होकर हार्वे हाल में एकत्र लोगों के लिये रक्त-संचार का प्रदर्शन कर रहा था। हार्वे समझा रहा था—"रक्त-वाहिनी शिराओं द्वारा रक्त हृदय में लाया जाता है। रक्त दाँयी ओर से आता है। फिर फैफड़ों में भरता और हवा से शुद्ध होता है और फिर बाँयी ओर चला जाता है और शरीर में चक्कर लगाता है। इस तरह वही रक्त शरीर में बार-बार आता-जाता रहता है। आध घंटे में हृदय उतना रक्त फेंकता है जितना कि सारे शरीर में होता है।" ऐसी बातें सुनकर उस हाल में एकत्र हुए लोग अचम्भे में आ गये। सदियों से लोग मानते चले आ रहे थे कि नाड़ियों में शुद्ध प्राण रहते हैं। और उस दिन हार्वे कह रहा था कि नाड़ियों में रक्त दौड़ता है। लोग ऐसी बातें मानने के लिये तैयार नहीं थे।

हार्वे पिछले चौदह वर्षों से रक्त-संचार संबंधी जाँच-पड़ताल कर रहा था। उसने छिपकली, चिड़िया आदि अनेक जीव—जन्तुओं को चीर-चीर कर देखा और पता लगाया था कि शरीर में रक्त दौड़ता है।

तेरह वर्ष तक उसने इसी बात की और जाँच की और १६२८ में अपनी रक्त-संचार संबधी प्रसिद्ध पुस्तक प्रकाशित की। हार्वे के नये विचार प्रकाशित होते ही वाद-विवाद का एक तूफान उठ खड़ा हुआ। पुराने विचार वाले सारे लोग उसके विरोधी हो गये। परिणाम स्वरूप उनके यहाँ इलाज के लिये आने वाले रोगियों की संख्या कम हो गई। ऐसे झक्की डाक्टर के हाथों में अपना शरीर सौंपने कौन तैयार था ?

हार्वे के विरुद्ध तरह-तरह की बातें उड़ाई गईं । हार्वे बादशाह के कृपा पात्रों में था और उन दिनों जनता बादशाह के विरुद्ध थी । क्रोध में आकर लोगों ने हार्वे के घर का सामान लूट लिया और उनकी चीजें जला दीं। हार्वे बड़े आर्थिक संकट में पड़ गये। लेकिन वे अपने काम में लगे रहे।

हार्वे की रक्त-संचार संबंधी खोज ने शरीर-विज्ञान में क्रांति उत्पन्न कर दी। अब शरीर-चिकित्सा में सफाई और स्वच्छ वायु पर विशेष ध्यान दिया जाने लगा।

---

४. आधुनिक रसायन शास्त्र के पिता : ऐन्टोनी लावो इसी के विचार

फ्रांस की क्रांति के बाद की बात है। उन दिनों फ्रांस की सत्ता उग्र विचारों के लोगों के हाथ में थी और राजवंश से संबंधित लोगों को मृत्यु दंड दिया जा रहा था। अबसे कोई डेढ़ सौ वर्ष पहले, ८ मई, १७६४ के दिन पेरिस में एक समृद्ध वैज्ञानिक को ऐसा ही मृत्यु दंड दिया गया । वैज्ञानिक का नाम आन्तोइने लावोइसी था। उसने आधुनिक रसायन शास्त्र की नींव डाली। अग्नि की प्रकृति का पता भी उसी ने लगाया। वह धनी था और उसने अपना बहुत-सा धन दीन-दुखियों के हितार्थ लगाया। सरकारी कोष के अध्यक्ष पद पर पहुँच कर उसने सिक्कों और तौल को नया रूप दिया। उसने एक आदर्श फार्म चलाया जिसे देखने दूर-दूर से लोग आते थे। उसने आहार को पोषक-तत्वों पर नये-नये प्रयोग किये। उसने बुढ़ापे की पेंशन के लिये बीमा की योजना चलाई। लेकिन, इन सब सार्वजनिक सेवाओं के बदले में उसे केवल मृत्यु-दण्ड मिला।

लावोइसी का सबसे महत्त्वपूर्ण काम रसायनशास्त्र में अनेक अनुसंधान हैं। उसने रसायनिक द्रव्यों को काँटे में तोलने की प्रणाली आरम्भ की। उससे पहले लोग अंदाज लगाते या कल्पना करते थे; सबसे पहले उसने रसायनिक द्रव्यों की वैज्ञानिक जांच-पड़ताल की और प्रकृति के नियमों का पता लगाया।

उदाहरण के लिये, सबसे पहले उसी ने अग्नि की प्रकृति का पता लगाया। आग में जलने के बाद राख बच रहती है। ऐसा क्यों होता है? लोग प्राचीन काल से मानते चले आरहे थे कि प्रत्येक वस्तु में अग्नि-तत्त्व होता है जो जलने पर हवा में उड़ जाता है और राख बच रहती है। लावोइसी ने तरह-तरह की चीजों को जला कर अनेक प्रयोग किये। उसने देखा कि अधिकतर चीजों का वज़न जलने पर घट जाता है। लेकिन कुछ चीजें ऐसी भी हैं जिनका कि वज़न जलने पर बढ़ता है। उदाहरण के लिये, टीन के टुकड़े को जलाने पर उसने देखा कि राख का वजन कम नहीं, अधिक निकला। साथ ही हवा का वजन उतना ही कम होगया। हाथ ही, राख और हवा का वज़न मिलकर पहले के बराबर ही रहा। इससे यह निष्कर्ष निकला कि पदार्थ नष्ट नहीं होता, केवल बदल जाता है।

अग्नि की प्रकृति का पता लगाने के साथ-साथ ही वायु की प्रकृति का भी पता लग गया। आक्सीजन और हाइड्रोजन गैसों के नाम भी लावोइसी ने रखे।

जिस समय फ्रांस की क्रांति आरम्भ हुई लावोइसी ने उसका स्वागत किया। वह सदा जनता के हित में लगा था। क्रान्ति से पहले वह जेलों और अस्पतालों में जा-जाकर वहां वालों की दशा सुधारने का प्रत्न करता रहता था। नयी सरकार ने उसे कोष का अध्यक्ष बनाया। उसने वेतन लेना अस्वीकार कर दिया और जनता के हित के कामों में लग गया।

लेकिन, बड़े खेद की बात है, कि मारां नाम के एक आदमी ने उसका कड़ा विरोध किया और उस पर मुकदमा चलवाया। कहते हैं, इस विरोध का कारण व्यक्तिगत द्वेष था। लोगों ने लावोइसी पर तरह-तरह के लांछन लगाये। किसी ने उसे उच्च कुलीन कहा; किसी ने उसे बादशाह का मित्र बताया; किसी ने कोई और दोष लगाया। अन्त में वह गिरफ्तार कर लिया गया। उसके मित्रों ने उसे भागने की सलाह दी, किन्तु उसने कहा, "मैंने अपना जीवन ठीक तरह बिताया है; अब मैं मरने के लिये तैयार हूँ।"

दुनियां के वैज्ञानिकों ने उसे बचाने का प्रयत्न किया। वह स्वयं केवल दो हफ्ते की अवधि और चाहता था जिससे कि वह अपने एक प्रयोग को पूरा

कर सके। लेकिन कठोर हृदय जज ने स्पष्ट कर दिया "हमें विद्वानों की जरूरत नहीं है"। और उसे मृत्यु-दण्ड दे दिया गया।

उसकी मृत्यु के बाद दुनिया ने लावोइसी के महत्व को समझा। उसके एक चित्र के नीचे लिखा हुआ है:

"वह अब भी जीवित है; अपनी प्रतिभा द्वारा वह अब भी मानवता की सेवा कर रहा है।"

—०—

५. धार्मिक का विद्रोह : जान वैस्ले

अठारहवीं सदी के जीवन में आमूल परिवर्तन जान वैस्ले ने किया। उसने एक ऐसा आन्दोलन चलाया कि सारे इङ्गलैंड में एक नयी विचारधारा फैल गई। पहले पादरी लोग खाली गिरजाघरों में धर्म चर्चा किया करते थे; वैस्ले ने ऐसी धार्मिक रुचि उत्पन्न की कि हजारों आदमी बाजारों और चौराहों पर धर्म की बातों के लिये एकत्र होने लगे। इङ्गलैंड से चलकर यह नया जोश अमरीका पहुँचा। पहले लोग शास्त्रों के दुरूह प्रश्नों पर शंका-समाधान किया करते थे; अब सामाजिक अनीतियों को दूर करने की ओर ध्यान दिया जाने लगा। ईसाई धर्म के सामाजिक पक्ष की ओर लोगों का ध्यान गया और गरीबों की दशा सुधारने के प्रयत्न होने लगे। अमीर लोगों की धन-लिप्सा, शराब पीने की आदत, जुआखोरी और दूसरे दुर्गुणों की बुराई होने लगी। दासों को बन्धन-मुक्त करने की चर्चाएं चलीं और चारों ओर सामाजिक सुधारों की लहर फैल गई। विलबरफोर्स और शेफ्ट्सबरी को इसी आन्दोलन से प्रेरणा मिली; फैक्टरी, जेल, स्कूल और अस्पतालों की दशा में सुधार इसी समय आरम्भ हुआ। गरीब, बीमार और पागलों की देख-रेख की ओर लोगों का ध्यान इन्हीं दिनों गया। और इस सब का श्रेय जान वैस्ले को है। उसके चलाये हुए आन्दोलन ने इस नयी विचारधारा का मार्ग प्रशस्त किया।

जान वैस्ले बड़ा अद्भुत आदमी था। उसका जन्म एक पादरी परिवार से हुआ। उसकी मां बड़े पक्के विचारों की महिला थीं और अपने बच्चों पर उनका बड़ा प्रभाव था। दोनों भाई चार्ल्स और जान वैस्ले बचपन से ही स्वतंत्र विचारों वाले थे। जब दोनों आक्सफोर्ड में पढ़ते थे तभी उन्होंने दूसरे

उदाहरण के लिये, सबसे पहले उसी ने अग्नि की प्रकृति का पता लगाया। आग में जलने के बाद राख बच रहती है। ऐसा क्यों होता है? लोग प्राचीन काल से मानते चले आरहे थे कि प्रत्येक वस्तु में अग्नि-तत्त्व होता है जो जलने पर हवा में उड़ जाता है और राख बच रहती है। लावोइसी ने तरह-तरह की चीजों को जला कर अनेक प्रयोग किये। उसने देखा कि अधिकतर चीजों का वज़न जलने पर घट जाता है। लेकिन कुछ चीजें ऐसी भी हैं जिनका कि वज़न जलने पर बढ़ता है। उदाहरण के लिये, टीन के टुकड़े को जलाने पर उसने देखा कि राख का वजन कम नहीं, अधिक निकला। साथ ही हवा का वजन उतना ही कम होगया। साथ ही, राख और हवा का वज़न मिलकर पहले के बराबर ही रहा। इससे यह निष्कर्ष निकला कि पदार्थ नष्ट नहीं होता, केवल बदल जाता है।

अग्नि की प्रकृति का पता लगाने के साथ-साथ ही वायु की प्रकृति का भी पता लग गया। आक्सीजन और हाइड्रोजन गैसों के नाम भी लावो-इसी ने रखे।

जिस समय फ्रांस की क्रांति आरम्भ हुई लावोइसी ने उसका स्वागत किया। वह सदा जनता के हित में लगा था। क्रान्ति से पहले वह जेलों और अस्पतालों में जा-जाकर वहां वालों की दशा सुधारने का प्रत्न करता रहता था। नयी सरकार ने उसे कोष का अध्यक्ष बनाया। उसने वेतन लेना अस्वी-कार कर दिया और जनता के हित के कामों में लग गया।

लेकिन, बड़े खेद की बात है, कि मारां नाम के एक आदमी ने उसका कड़ा विरोध किया और उस पर मुकदमा चलवाया। कहते हैं, इस विरोध का कारण व्यक्तिगत द्वेष था। लोगों ने लावोइसी पर तरह-तरह के लांछन लगाये। किसी ने उसे उच्च कुलीन कहा; किसी ने उसे बादशाह का मित्र बताया; किसी ने कोई और दोष लगाया। अन्त में वह गिरफ्तार कर लिया गया। उसके मित्रों ने उसे भागने की सलाह दी, किन्तु उसने कहा, "मैंने अपना जीवन ठीक तरह बिताया है; अब मैं मरने के लिये तैयार हूँ।"

दुनियां के वैज्ञानिकों ने उसे बचाने का प्रयत्न किया। वह स्वयं केवल दो हफ्ते की अवधि और चाहता था जिससे कि वह अपने एक प्रयोग को पूरा

कर सके। लेकिन कठोर हृदय जज ने स्पष्ट कर दिया "हमें विद्वानों की जरूरत नहीं है"। और उसे मृत्यु-दण्ड देदिया गया।

उसकी मृत्यु के बाद दुनिया ने लावोइज़ी के महत्व को समझा। उसके एक चित्र के नीचे लिखा हुआ है:

"वह अब भी जीवित है; अपनी प्रतिभा द्वारा वह अब भी मानवता की सेवा कर रहा है।"

—०—

५. धार्मिक का विद्रोह : जान वैस्ले

अठारहवीं सदी के जीवन में आमूल परिवर्तन जान वैस्ले ने किया। उसने एक ऐसा आन्दोलन चलाया कि सारे इङ्गलैंड में एक नयी विचारधारा फैल गई। पहले पादरी लोग खाली गिरजाघरों में धर्म चर्चा किया करते थे; वैस्ले ने ऐसी धार्मिक रुचि उत्पन्न की कि हजारों आदमी बाजारों और चौराहों पर धर्म की बातों के लिये एकत्र होने लगे। इङ्गलैंड से चलकर यह नया जोश अमरीका पहुँचा। पहले लोग शास्त्रों के दुरूह प्रश्नों पर शंका-समाधान किया करते थे; अब सामाजिक अनीतियों को दूर करने की ओर ध्यान दिया जाने लगा। ईसाई धर्म के सामाजिक पक्ष की ओर लोगों का ध्यान गया और गरीबों की दशा सुधारने के प्रयत्न होने लगे। अमीर लोगों की धन-लिप्सा, शराब पीने की आदत, जुआखोरी और दूसरे दुर्गुणों की बुराई होने लगी। दासों को बन्धन-मुक्त करने की चर्चाएँ चलीं और चारों ओर सामाजिक सुधारों की लहर फैल गई। विल्बरफोर्स और शेफ्टूसबरी को इसी आन्दोलन से प्रेरणा मिली; फैक्टरी, जेल, स्कूल और अस्पतालों की दशा में सुधार इसी समय आरम्भ हुआ। गरीब, बीमार और पागलों की देख-रेख की ओर लोगों का ध्यान इन्हीं दिनों गया। और इस सब का श्रेय जान वैस्ले को है। उसके चलाये हुए आन्दोलन ने इस नयी विचारधारा का मार्ग प्रशस्त किया।

जान वैस्ले बड़ा अद्भुत आदमी था। उसका जन्म एक पादरी परिवार से हुआ। उसकी मां बड़े पक्के विचारों की महिला थीं और अपने बच्चों पर उनका बड़ा प्रभाव था। दोनों भाई चार्ल्स और जान वैस्ले बचपन से ही स्वतंत्र विचारों वाले थे। जब दोनों आक्सफोर्ड में पढ़ते थे तभी उन्होंने दूसरे

लोगों से अलग तरीके की रहन-सहन से हलचल मचा दी। उन्होंने "होली क्लब" नाम की एक संस्था स्थापित की जिसके सदस्य विचारवान छात्र ही होते थे।

आक्सफोर्ड छोड़ने के बाद जान वैस्ले को अपने पिता की जगह मिली लेकिन उन्होंने अस्वीकार कर दिया। वे अपने भाई के साथ अमरीकावासियों को ईसाई बनाने के लिये निकल पड़े। उन्होंने अपनी सब सुख-सुविधाओं से ध्यान हटा लिया और सुधार के कामों में लग गये।

अमरीका में उन्हें अधिक सफलता न मिल सकी। उनकी वैयक्तिक सुन्दरता ने अनेक महिलाओं को मोहित कर लिया और उनके मार्ग में बाधाएँ उत्पन्न हो गईं।

इंगलैंड लौटने के बाद जान वैस्ले ने खुली सभाओं में भाषण देने और लोगों को समझाने की रीति अपनाई। ऐसी सभाएँ बड़ी लोकप्रिय हुईं और हजारों की संख्या में लोग एकत्र होने लगे।

जान वैस्ले का कहना था वैयक्तिक जीवन की शुद्धता धर्म को पहली सीढ़ी है। सबसे पहले हरेक आदमी को आत्म-निरोध सीखना चाहिये। अच्छे नागरिकों से ही अच्छा समाज बनता है। ईसाई धर्म वास्तव में सामाजिक धर्म है। इसको एकाकी धर्म बनाना इसे नष्ट करना है।

इन नये विचारों का लोगों पर बड़ा प्रभाव पड़ा। चारों ओर शराब-बन्दी की बातें होने लगीं। वासनायुक्त जीवन बुरा समझा जाने लगा। मुर्गों और सांड़ों की लड़ाइयों से लोगों का मन फिरा और वे अपने बाल-बच्चों और गृहस्थ की ओर अधिक ध्यान देने लगे। इस तरह सारे देश में एक नया कार्य-क्रम चला और उत्साह की एक नयी लहर फैली।

इस नयी चेतना के प्रचार में जान वेस्ले ने बड़ा परिश्रम किया और बड़े-बड़े कष्ट सहे। वे हर वर्ष चार-पाँच हजार मील का दौरा करते और जगह-जगह भाषण देते थे उनके विरोधियों के बुरे बर्ताव की उन्हें कुछ चिन्ता न थी। बुरा मौसम या शरीरिक अस्वस्थता भी उन्हें अपने काम से नहीं डिगा सकती थी। कई बार उन्हें लोगों ने घेर लिया और कुछ लोग उन्हें मारने के लिये तैयार हो गये। लेकिन, वैस्ले ने बड़ी गम्भीरता से स्थिति का

सामना किया और शान्तिपूर्ण ढ़ंग से अपने काम में लगे रहे।

उन्होंने लगभग पचास वर्ष तक अपने नये विचारों का प्रचार किया। उन्होंने 'यूनाइटेड सोसाइटी आफ मैथाडिस्टस' की स्थापना की। थोड़े ही दिनों में सोसाइटी के पास अपना भवन हो गया और अपना कोष जमा हो गया। लन्दन और ब्रिस्टल में दवाखाने खुल गये, न्यूकासिल में अनाथ बच्चों के रहने की जगह बन गई। आश्चर्य की बात तो यह है कि जान वेस्ले स्वयं इन सब संस्थाओं का संचालन करते थे। अपने ८८ वर्ष के जीवन में उन्होंने लगातार अथक परिश्रम किया और तत्कालीन समाज के ढाँचे बदलने में बड़ी सफलता पाई।

---

६. मनुष्य के अधिकार : रूसो के विचार

आजकल हम चारों ओर "स्वतंत्रता", "स्वाधीनता," "समानता," "प्रजातंत्र" की आवाज सुनते हैं। शायद हमें विश्वास न हो कि कोई पौने दो सौ वर्ष पहले ऐसे नारे चुनौती देने वाले समझे जाते थे और उन पर बड़ी लड़ाई चल रही थी। उन दिनों, ऐसा लगता था, जैसे सारी सभ्यता की जड़ें हिल रही हैं और दुनियाँ में एक नये तरह के विचारों का तूफान आ रहा है। इन नये विचारों को स्पष्ट करने और आगे बढ़ाने का श्रेय जीन जैक़ी रूसो को है।

रूसो से पहले भी कुछ लोग ऐसी ही बातें सोचने लगे थे। लेकिन रूसो ने सबसे पहले स्पष्ट शब्दों में इन नये विचारों की घोषणा की और पुरानी विचारधारा को चुनौती दी। "स्वाधीनता, समानता और भ्रातृभाव" का नारा उन्होंने ही उठाया।

रूसो के विचारों का तत्कालीन योरप पर बड़ा प्रभाव पड़ा। उनकी एक पुस्तक ने फ्रांसीसी क्रांति का रास्ता तैयार किया। उनकी दूसरी पुस्तक ने शिक्षा प्रणाली बदली और मांटसेरी जैसी पद्धतियों को जन्म दिया। उनकी तीसरी पुस्तक ने साहित्य में प्रकृति-प्रेम की प्रथा चलाई। उनकी चौथी पुस्तक ने एक नये प्रकार का आत्म चरित लिखने की पद्धति प्रारंभ की जिसकी

नीतिक सभाएँ होती थीं, लेकिन ऐसी स्त्रियाँ केवल अपवाद थीं। अधिकतर स्त्रियां घरों की चारदीवारी के भीतर बन्द रहती थीं।

सन् १७९२ में मैरी वोल्स्टोनक्राफ्ट ने स्त्रियों के अधिकारों पर एक पुस्तक लिखी जिसका नाम रखा "A Vindication of the Right of Women." यह फ्रांसीसी क्रांति के कुछ वर्षों बाद की बात है। उन दिनों चारों ओर अधिकारों की चर्चा हो रही थी। लेकिन स्त्रियों के अधिकारों की तो कोई सोच भी नहीं सकता था। स्वयं रूसो ने स्त्रियों के विषय में लिखा था कि, स्त्रियों की शिक्षा पुरुषों से संबंधित होनी चाहिये। इस शिक्षा का उद्देश्य पुरुष को प्रसन्न करना, उसके लिये लाभदायक होना, उसके आदर योग्य बनना, बचपन में उसको शिक्षा देना, बड़े होने पर उसकी देख भाल करना, सान्त्वना देना और समझाना है। नारी के सदा यही कर्त्तव्य हैं और यही उन्हें सिखाना चाहिये।"

जब रूसो जैसे उदार विचारों वाले पुरुष के ऐसे विचार थे तो हम कल्पना कर सकते हैं कि उन दिनों दूसरे लोगों के इस विषय पर क्या विचार होंगे। मेरी वोल्स्टोनक्राफ्ट ने अपनी पुस्तक में स्त्रियों के अधिकारों की हिमायत करके बड़े साहस का काम किया।

स्वयं मैरी का जीवन बड़ा दुखी था। उसके माता-पिता झगड़ते रहते थे और कभी-कभी तो मैरी को रात भर उनमें बीच-बचाव के लिये तैयार रहना पड़ता था। मैरी की बहन एलीजा का विवाह एक क्रोधी के साथ हुआ और थोड़े दिनों बाद उसको भी मैरी को अपने साथ रखना पड़ा। मैरी बड़ी कठिनाई से घर का खर्चा चलाती थी। अपने संकटों की कहानी उसने Mary नाम के उपन्यास में लिखी है।

मैरी ने स्त्रियों के अधिकारों का नारा बुलंद कर जिस आन्दोलन का आरम्भ किया उसकी कहानी बड़ी मनोरंजक है। मैरी की पुस्तक के प्रकाशन से ५० वर्ष बाद, सन् १८४७ में, ऐन नाइट नाम की एक महिला ने एक पुस्तिका द्वारा स्त्रियों के लिये मताधिकार की मांग की थी। सन् १८६९ में जान स्टुआर्ट ने मिल इसी आशय का एक बिल पार्लमेंट में रखा। उससे दो वर्ष बाद अमरीका के एक राज्य में कुछ स्त्रियों को मत देने का अधिकार मिला। फिर

१६०७ में, सबसे पहले फिनलैंड में स्त्रियों को मत देने का अधिकार दिया गया। इङ्गलैंड में स्त्रियों को अपने स्वत्वों के लिये बड़ी लम्बी लड़ाई लड़नी पड़ी।

उन दिनों तक स्त्रियों को शिक्षा प्राप्त करने का भी समान अधिकार नहीं था। १६२५ से पहले तक स्त्रियाँ आक्सफोर्ड और कैम्ब्रिज विश्वविद्यालयों में प्रविष्ट नहीं हो सकती थीं।

शिक्षा के मार्ग में रुकावटों के साथ-साथ स्त्रियों के लिये पेशे भी बन्द थे। जब मिस जैक्स-ब्लेक ने १८६६ में डाक्टरी करने की अनुमति चाही तो लोगों को बड़ा आश्चर्य हुआ। बीस साल बाद एक स्त्री को डाक्टरी की सनद मिली। कानून, इंजिनिअरिंग, कामर्स, दुकानदारी—सभी में स्त्रियों को पुरुष की बराबरी करने के लिये, बड़ी चीख-पुकार करनी पड़ी।

पिछले डेढ़ सौ वर्षों में स्त्रियों ने बड़ी उन्नति की है। आजकल वे प्रत्येक स्थान पर पुरुषों के बराबर समझी जाती हैं। अब वे स्वतंत्र व्यवसाय कर सकती हैं, नौकरी कर सकती हैं, राजनीति में भाग ले सकती हैं। कोई भी सभ्य देश आजकल स्त्रियों को पुरुषों से हीन नहीं समझता। इस सब का श्रेय मैरी वोलस्टोन क्राफ्ट जैसी महिलाओं को है।

———

८. टौल पूडल की दुर्घटना : ट्रेड यूनियन की विचार धारा

१६ मार्च, १८३४ के दिन टौलपूडल नाम के एक छोटे से गाँव के छः सीधे-सादे किसानों को सात-सात वर्ष के काले पानी की सज़ा दी गई। यह बड़ी कठोर सज़ा थी क्योंकि सात साल बाद, बेंतों की मार, भूख, दुर्दशा और एकान्त वास से बचकर किसी के लौटने की आशा नहीं थी। इन लोगों का कसूर था कि इन्होंने एक गुप्त, गैरकानूनी क़सम खाई थी। इस अपराध के लिए इन भोले किसानों को इतना कठोर दण्ड देने का कारण था। सत्ताधारी लोग मज़दूरों के संगठन को तोड़ना चाहते थे। दूसरे मज़दूरों को डराने के लिये इन किसानों को ऐसी सजा दी गई थी।

अधिकारी लोग इससे डर गये। पड़ोसी देश फ्राँस में जनता की करतूतों को वे देख ही रहे थे। मिल मालिकों ने सरकार से प्रार्थना की कि मज़दूरों की कार्यवाही पर रोक लगा दी जाय। सरकार ने मज़दूरों का संगठन निषिद्ध करार दे दिया। सरकारी लोग मजदूरों के संगठन के बारे में क्या सोचते थे इसका पता एक जज के इस बयान से लगेगा :—

"चूँकि ऐसे अपराध (एकत्र होकर हड़ताल करना) तुम लोगों में बहुत बढ़ते जारहे हैं और तुम लोग अपने मालिकों को दुआ देने के स्थान पर उनकी बरबादी चाहते हो, इसलिए तुम्हें सख्त सजा मिलनी चाहिये जिससे आगे को नसीहत मिले।"

ऐसे वातावरण में मज़दूरों का संगठन आन्दोलन आरम्भ हुआ। दमन के डर से मज़दूर चुपके-चुपके संगठन करने लगे। आपसी विश्वास प्राप्त करने और अपना संगठन दृढ़ करने के लिये तरह-तरह के उपचार काम में लाये गये। नंगी तलवारों, केकालों और कुल्हाड़ियों को हाथ में लेकर शपथें खाने का तात्पर्य यही था कि लोग संकट के समय एक दूसरे का साथ दें और घबड़ाएँ नहीं।

जब टौलपूडल के मज़दूरों को कठोर दण्ड दिया गया तो उन्होंने शहीदों की तरह साहस रखा और वे घबड़ाये नहीं। इसकी प्रतिक्रिया सारे देश में हुई। चारों ओर मज़दूर आन्दोलन जोर पकड़ने लगा और अन्त में टौलपूडल के उन छः शहीदों की विजय हुई।

जब उन छः शहीदों ने मजदूर-संगठन आरम्भ किया तो वे गरीब, निस्सहाय और निर्बल थे। लेकिन उनके पीछे एक महान विचारधारा का बल था। अंत में वे ही जीते।

———

६. विकासवाद : डारविन, वैलेस और हक्सले की विचारधारा

आजकल नये विचारों का हर एक आदमी विकासवाद के सिद्धान्त को मानता है। लेकिन, शायद बहुत थोड़े लोग यह जानते होंगे कि सिर्फ सौ

लेकिन, ऐसी कठोर सज़ाओं से मजदूर-संगठन टूटने के बजाय और दृढ़ होगया। यह मज़दूरों के लिये सीधी चुनौती थी।

वे मज़दूर कोई बड़ी मांग भी तो नहीं कर रहे थे। अनाज की कीमत बढ़ गई थी और ये लोग ७ शिलिंग हफ्तावार की जगह १० शिलिंग चाहते थे। आजकल ऐसी मांग कोई अपराध ही नहीं है। उन दिनों भी यह कोई क़ानूनी अपराध नहीं था क्योंकि मज़दूर लोगों ने दो ही साल पहले इकट्ठे होकर अपनी माँग करने का अधिकार प्राप्त किया था। लेकिन उस गाँव के अधिकारी दकियानूसी थे और ऐसे झगड़ों को सदा के लिये खत्म करना चाहते थे। उन्होंने Grand Lodge of the Labourer's Friendly Society स्थापित करने के अपराध में उन छः गरीब मज़दूरों को सात वर्ष के कठोर काले पानी की सज़ा दी।

इन छः मज़दूरों का यह संगठन एक बड़े आन्दोलन का अंग था जो अठारवीं सदी के अन्तिम वर्षों में आरम्भ हुआ था। यह आन्दोलन व्यवसायिक क्रान्ति का एक परिणाम था। मशीनों के चलन से पहले मज़दूर अपने घरों में काम करते थे और उनकी बनाई हुई चीजों का भाव उन्हीं की संस्था "गिल्ड" नियत करती थी। लेकिन, कोयला, भाप और मशीनों के युग में यह सब कुछ बदल गया। दुकानों का स्थान कारखानों ने लेलिया और एक कारीगर के स्थान पर हज़ारों मिलकर एक जगह काम करने लगे। जैसे-जैसे नई-नई मशीनें निकलने लगीं मज़दूरों की आवश्यकता घटती गई और बेकारी बढ़ी। इसी समय आडम स्मिथ ने एक किताब लिखी जिसमें बतलाया कि अगर प्रत्येक आदमी, अपने-अपने लाभ के लिये काम करे और सरकार कुछ हस्तक्षेप न करे तो आपको लाभ होगा और देश की समृद्धि बढ़ेगी। मिल-मालिकों को यह बात जँची, किन्तु मज़दूर पिस गये। दिनोंदिन बेकारी फैलने लगी और मज़दूरों की छंटनी आरम्भ होगई।

भूखे मज़दूरों ने कहीं-कहीं उत्पात किये। धीरे-धीरे उन्हें यह भी सूझा कि अगर सब लोग मिलकर काम करें और ऐसे संकट के लिए कुछ बचाकर रखें तो उन्हें लाभ होगा। उन्होंने दूसरे मज़दूरों को उनकी जगह काम पर आने से भी रोकना आरम्भ कर दिया।

अधिकारी लोग इससे डर गये। पड़ोसी देश फ्राँस में जनता की करतूतों को वे देख रही रहे थे। मिल मालिकों ने सरकार से प्रार्थना की कि मज़दूरों की कार्यवाही पर रोक लगा दी जाय। सरकार ने मज़दूरों का संगठन निषिद्ध करार दे दिया। सरकारी लोग मजदूरों के संगठन के बारे में क्या सोचते थे इसका पता एक जज के इस बयान से लगेगा :—

"चूँकि ऐसे अपराध (एकत्र होकर हड़ताल करना) तुम लोगों में बहुत बढ़ते जारहे हैं और तुम लोग अपने मालिकों को दुआ देने के स्थान पर उनकी बरबादी चाहते हो, इसलिए तुम्हें सख्त सजा मिलनी चाहिये जिससे आगे को नसीहत मिले।"

ऐसे वातावरण में मज़दूरों का संगठन आन्दोलन आरम्भ हुआ। दमन के डर से मज़दूर चुपके-चुपके संगठन करने लगे। आपसी विश्वास प्राप्त करने और अपना संगठन दृढ़ करने के लिये तरह-तरह के उपचार काम में लाये गये। नंगी तलवारों, कंकालों और कुल्हाड़ियों को हाथ में लेकर शपथें खाने का तात्पर्य यही था कि लोग संकट के समय एक दूसरे का साथ दें और घबड़ाएँ नहीं।

जब टौलपूडल के मज़दूरों को कठोर दण्ड दिया गया तो उन्होंने शहीदों की तरह साहस रखा और वे घबड़ाये नहीं। इसकी प्रतिक्रिया सारे देश में हुई। चारों ओर मज़दूर आन्दोलन जोर पकड़ने लगा और अन्त में टौलपूडल के उन छः शहीदों की विजय हुई।

जब उन छः शहीदों ने मजदूर-संगठन आरम्भ किया तो वे गरीब, निस्सहाय और निर्बल थे। लेकिन उनके पीछे एक महान विचारधारा का बल था। अंत में वे ही जीते।

---

९. विकासवाद : डारविन, वैलैस और हक्सले की विचारधारा

आजकल नये विचारों का हर एक आदमी विकासवाद के सिद्धान्त को मानता है। लेकिन, शायद बहुत थोड़े लोग यह जानते होंगे कि सिर्फ सौ

वर्ष पहले इस पर बड़ा वाद-विवाद चल रहा था और इस नयी विचारधारा के अनुयायी और विरोधी एक-दूसरे की कटु आलोचना कर रहे थे।

उन्नीसवीं सदी के मध्य में डारविन ने यह सिद्ध किया कि सृष्टि अबसे कोई छः हजार वर्ष पहले ईश्वर ने छः दिनों में नहीं की, बल्कि संसार के प्राणियों के क्रमिक विकास में लाखों वर्ष लगे।

वास्तव में विकासवाद की विचारधारा बड़ी पुरानी है। प्राचीन यूनानियों को इसकी थोड़ी-बहुत जानकारी रही होगी। उनके बाद मध्य युग के कुछ समझदार लोगों को भी इसका पता था। जर्मनी कवि गेटे ने इसकी पुष्टि डारविन से पहले की थी। डारविन के दादा इरेस्मस डारविन इसी में विश्वास करते थे।

लेकिन ऐसे लोगों की संख्या सदा बहुत रही जो इस विचारधारा के कट्टर विरोधी थे। इसका सबसे अधिक विरोध पादरियों ने किया। पादरी लोग बाइबिल की कथा के विरुद्ध किसी सिद्धान्त को मानने के लिये तैयार नहीं थे। बाइबिल में साफ लिखा था कि संसार के सब प्राणी ईश्वर ने ईसा से ४००४ वर्ष पहले ६ दिन में बनाये। डारविन इससे अलग बात कहता था। चूंकि बाइबिल गलत हो नहीं सकता था। इसलिये डारविन ही गलत होना चाहिये।

पुराने कट्टरवादियों और डारविन के अनुयाइयों में बहुत समय तक झड़पें होती रहीं। जब डारविन के अनुयाइयों ने ऐसे जानवरों की हड्डियों का हवाला दिया जो अब नहीं मिलते तो पादरियों ने जबाब दिया कि वे भी उन्हीं छः दिनों में बनाये गये थे। किसी ने यह भी कह दिया कि ये हड्डियाँ ईश्वर ने चट्टानों में उन्नीसवीं सदी के लोगों की श्रद्धा जांचने के लिये रखदी थीं।

स्वयं डारविन ने विकासवाद के सिद्धान्त की कड़ी जाँच-पड़ताल की। उन्होंने वर्षों तक जगह-जगह के जीव-जन्तुओं का निरीक्षण किया और फिर निष्कर्ष निकाले। इक्कीस वर्ष की अवस्था में उन्हें प्रशान्त महासागर की यात्रा करने का अवसर मिला। इसके बाद वर्षों तक वे अध्ययन और परीक्षण करते

रहे। उन्होंने देखा कि एक टापू के पशु पक्षियों में दूसरे टापू के रहने वालों से भिन्नता मिलती है। इस भिन्नता का क्या कारण हो सकता है?

इस भिन्नता का कारण पता लगाने के लिये डारविन को वर्षों कठिन परिश्रम करना पड़ा। अंत में, उन्हें पता लगा कि प्रकृति में एक प्रकार की क्रिया चलती रहती हैं जिसे 'योग्यतमावशेष' कहा जा सकता है। प्रकृति केवल उन्हीं जीव-जन्तुओं को बचने देती है जिनमें जीवित रहने की कोई विशेष क्षमता होती है। बाकी जीव-जन्तु जीवन के संघर्ष में धीरे-धीरे क्षीण होते और मरते रहते हैं।

डारविन के साथ-साथ वैलैस की चर्चा भी यहाँ आवश्यक है। जिन दिनों डारविन विकासवाद का अध्ययन कर रहा था उन्हीं दिनों मलाया में अल्फ्रेड रसेल वैलैस भी इसी समस्या को सुलझाने का प्रयत्न कर रहा था। अन्त में दोनों एक ही निष्कर्ष पर पहुँचे। डारविन ने उदारता पूर्वक वैलैस के कार्य को स्वीकार किया।

जब डारविन की पुस्तक The Origin of Specis प्रकाशित हुई तो बड़ी लोकप्रिय हुई। हाथों हाथ उसके कई संस्करण समाप्त होगये। दूसरी ओर पादरियों ने इसका कड़ा विरोध किया। डारविन के अनुयाइयों में हक्सले का नाम उल्लेखनीय है। हक्सले विरोधियों से वाद-विवाद करता और विकासवाद के सिद्धान्त का प्रचार करता था। एक बार जब हक्सले विकासवाद का सिद्धान्त समझा रहा था विशप विल्बरफोर्स ने उससे पूछा कि क्या वह लंगूरों से सम्बन्धित होना स्वीकार करेगा। हक्सले ने जवाब दिया, "हाँ, मैं लंगूरों से सम्बन्धित होना तुमसे सम्बन्धित होने से अच्छा समझूँगा।"

धीरे-धीरे विकासवाद का सिद्धान्त फैलता गया और अधिकतर लोग डारविन की बात मानने लगे। इस प्रकार डारविन ने दुनिया की विचारधारा बदल दी। डारविन के बाद दूसरे लोगों ने उसके सिद्धान्तों की खोज-बीन की और नये-नये रहस्यों का पता लगाया।

—०—

१०. मानव जाति और जीवाणु :
पाश्च्यो और कोश की सूझ

रोग कीटाणुओं द्वारा एक प्राणी से दूसरे प्राणी तक पहुँचता है यह बात सोलहवीं सदी के एक इटलीवासी डाक्टर ने कही। जैसे बीज इधर-उधर फैलकर पेड़-पौधे को जन्म देते हैं उसी तरह बीमारी के बीज—कीटाणु भी एक रोगी से दूसरे को लगते हैं और रोग फैलाते हैं। लेकिन उन दिनों लोगों ने इस बात पर कोई विशेष ध्यान न दिया।

सौ वर्ष बाद, सत्रहवीं सदी में, टामस सिडेनहम नाम के अंग्रेज डाक्टर ने इस बात की जाँच-पड़ताल आरम्भ की कि क्या रोग कीटाणुओं द्वारा एक शरीर से दूसरे तक पहुँचते हैं। लगभग इन्हीं दिनों जर्मनी में किचनर नाम के एक डाक्टर खुर्दबीन की सहायता से रोगियों के रक्त की परीक्षा द्वारा इन जीवित कीटाणुओं का पता लगा रहे थे।

इसके बाद कोई सौ वर्ष तक यह बात जहाँ की तहाँ रही। उन्नीसवीं सदी के मध्य में इस विषय की खोज फिर आरम्भ हुई। फ्रांस में लुई पाश्च्यो और जर्मनी में राबर्ट कोश इस नये आन्दोलन के नेता थे।

लुई पाश्च्यो का जन्म १८२२ में हुआ था। आरम्भ में उनकी रुचि चमकीले धातुओं के अध्ययन में थी लेकिन थोड़े ही दिनों में वे कीटाणुओं की उत्पत्ति की खोज में लग गये। आरम्भ में इस सूझ का विरोध हुआ। उन दिनों के वैज्ञानिक कीटाणुओं का अस्तित्व मानने के लिए तैयार नहीं थे।

लुई पाश्च्यो की विचारधारा कीटाणुओं के अस्तित्व की ओर विशेषतया शराब के विपर्यय द्वारा मुड़ी। शराब के एक व्यापारी ने उनसे शराब के खट्टे हो जाने की शिकायत की। जब पाश्च्यो ने शराब की सूक्ष्म दर्शक यंत्र से परीक्षा की तो उन्हें पता लगा कि उसमें भी कीटाणु रहते हैं। उसी दिन से वे कीटाणुओं के अनुसंधान में लग गये। उन्होंने पता लगाया कि ये कीटाणु बहुत अधिक गर्मी या बहुत अधिक सर्दी में जीवित नहीं रहते। जिसे आजकल "पाश्च्यो की प्रणाली" कहते हैं वह उन्हीं की चलाई हुई है। पहले शराब—

या ऐसी ही किसी और चीज को—खूब गरम करो जिससे ये कीटाणु मर जायें और फिर उसे धूल से बचा कर रख दो। यही पाश्च्यो की प्रणाली है। पाश्च्यो ने यह भी पता लगाया कि कीटाणु हवा द्वारा इधर-उधर फैलते हैं। इसका उन्होंने बड़ा आकर्षण प्रयोग करके दिखाया। उन्होंने काच की टेढ़ी-मेढ़ी नलियों में होकर द्रव पदार्थों को निकाला। जब इन नलियों में होकर हवा गुजरी तो उसमें मिले हुए रज-कण नलियों की सतह से ही चिपके रह गये। पेरिस की हवा में—जिसमें धूल मिली हुई थी—तो कीटाणु बढ़े; किन्तु आल्पस पहाड़ पर कीटाणु पैदा न हुए। इससे सिद्ध होगया कि कीटाणुओं की उत्पत्ति और बढ़ोतरी हवा द्वारा होती है और वे एक खास तापक्रम के भीतर ही जीवित रह सकते हैं।

शराब के बाद पाश्च्यो ने रेशम के कीड़ों का अध्ययन आरम्भ किया। उनका विश्वास था कि रेशम के कीड़ों में जो रोग फैल रहा था वह भी कीटाणुओं द्वारा ही था।

इन दिनों पाश्च्यो का बड़ा विरोध हो रहा था। लेकिन कुछ ऐसे भी लोग थे जो उनका साथ दे रहे थे। म्यूनिक के डाक्टर जोसफ वौन पैटैनकोफर इन्हीं दिनों सफाई पर जोर देरहे थे और पाश्च्यो के सिद्धान्त का अनुमोदन कर रहे थे। उनके विचारों की असल परीक्षा तो तब हुई जब म्यूनिक की नुमाइश में एकत्र भीड़ में हैजा फैल गया और उन्होंने यह सिद्ध करने के लिये कि, जब तक कीटाणुओं को अनुकूल वातावरण नहीं मिलता वे नहीं पनपते, लाखों कीटाणुओं को पी लिया और उन्हें कुछ न हुआ।

१८७० में जब फ्रैंको-प्रशन लड़ाई छिड़ी तो इस सिद्धान्त की और भी परीक्षा होगई। लिस्टर ने घावों की सफाई पर बड़ा जोर दिया और इसका परिणाम यह हुआ कि घायल जर्मनी सिपाहियों के घाव जल्दी अच्छे हुए। एक वर्ष बाद लिस्टर ने जर्मनी से पाश्च्यो को एक पत्र लिखा जिसमें कि उसने पाश्च्यो की खोज स्वीकार की। इस पत्र से पाश्च्यो बड़ा उत्साहित हुआ।

पाश्च्यो की अगली विजय भेड़ और मवेशी में फैलने वाली बीमारी की रोक-थाम में हुई। जर्मनी में राबर्ट कोश इसी का अन्वेषण कर रहे थे।

१०. मानव जाति और जीवाणु : पाश्च्यो और कोश की सूझ

रोग कीटाणुओं द्वारा एक प्राणी से दूसरे प्राणी तक पहुँचता है यह बात सोलहवीं सदी के एक ,इटलीवासी डाक्टर ने कही। जैसे बीज इधर-उधर फैलकर पेड़-पौधे को जन्म देते हैं उसी तरह बीमारी के बीज—कीटाणु भी एक रोगी से दूसरे को लगते हैं और रोग फैलाते हैं। लेकिन उन दिनों लोगों ने इस बात पर कोई विशेष ध्यान न दिया।

सौ वर्ष बाद, सत्रहवीं सदी में, टामस सिडेनहम नाम के अंग्रेज डाक्टर ने इस बात की जाँच-पड़ताल आरम्भ की कि क्या रोग कीटाणुओं द्वारा एक शरीर से दूसरे तक पहुँचते हैं। लगभग इन्हीं दिनों जर्मनी में किचनर नाम के एक डाक्टर खुर्दबीन की सहायता से रोगियों के रक्त की परीक्षा द्वारा इन जीवित कीटाणुओं का पता लगा रहे थे।

इसके बाद कोई सौ वर्ष तक यह बात जहाँ की तहाँ रही। उन्नीसवीं सदी के मध्य में इस विषय की खोज फिर आरम्भ हुई। फ्रांस में लुई पाश्च्यो और जर्मनी में रावर्ट कोश इस नये आन्दोलन के नेता थे।

लुई पाश्च्यो का जन्म १८२२ में हुआ था। आरम्भ में उनकी रुचि चमकीले धातुओं के अध्ययन में थी लेकिन थोड़े ही दिनोंमें वे कीटाणुओं की उत्पत्ति की खोज में लग गये। आरम्भ में इस सूझ का विरोध हुआ। उन दिनों के वैज्ञानिक कीटाणुओं का अस्तित्व मानने के लिए तैयार नहीं थे।

लुई पाश्च्यो की विचारधारा कीटाणुओं के अस्तित्व की ओर विशेषतया शराब के विपर्यय द्वारा मुड़ी। शराब के एक व्यापारी ने उनसे शराब के खट्टे हो जाने की शिकायत की। जब पाश्च्यो ने शराब की सूक्ष्म दर्शक यंत्र से परीक्षा की तो उन्हें पता लगा कि उसमें भी कीटाणु रहते हैं। उसी दिन से वे कीटाणुओं के अनुसंधान में लग गये। उन्होंने पता लगाया कि ये कीटाणु बहुत अधिक गर्मी या बहुत अधिक सर्दी में जीवित नहीं रहते। जिसे आजकल "पाश्च्यो की प्रणाली" कहते हैं वह उन्हीं की चलाई हुई है। पहले शराब—

या ऐसी ही किसी और चीज को—खूब गरम करो जिससे ये क्रीटाणु मर जायें और फिर उसे धूल से बचा कर रख दो। यही पाश्च्यो की प्रणाली है। पाश्च्यो ने यह भी पता लगाया कि क्रीटाणु हवा द्वारा इधर-उधर फैलते हैं। इसका उन्होंने बड़ा आकर्षण प्रयोग करके दिखाया। उन्होंने काच की टेढ़ी-मेढ़ी नलियों में होकर द्रव पदार्थों को निकाला। जब इन नलियों में होकर हवा गुजरी तो उसमें मिले हुए रज-कण नलियों की सतह से ही चिपके रह गये। पेरिस की हवा में—जिसमें धूल मिली हुई थी—तो क्रीटाणु बढ़े; किन्तु आल्पस पहाड़ पर क्रीटाणु पैदा न हुए। इससे सिद्ध होगया कि क्रीटाणुओं की उत्पत्ति और बढ़ोतरी हवा द्वारा होती है और वे एक खास तापक्रम के भीतर ही जीवित रह सकते हैं।

शराब के बाद पाश्च्यो ने रेशम के कीड़ों का अध्ययन आरम्भ किया। उनका विश्वास था कि रेशम के कीड़ों में जो रोग फैल रहा था वह भी क्रीटाणुओं द्वारा ही था।

इन दिनों पाश्च्यो का बड़ा विरोध हो रहा था। लेकिन कुछ ऐसे भी लोग थे जो उनका साथ दे रहे थे। म्यूनिक के डाक्टर जोसफ वौन पैटैनकोफर इन्हीं दिनों सफाई पर जोर देरहे थे और पाश्च्यो के सिद्धान्त का अनुमोदन कर रहे थे। उनके विचारों की असल परीक्षा तो तब हुई जब म्यूनिक की नुमाइश में एकत्र भीड़ में हैजा फैल गया और उन्होंने यह सिद्ध करने के लिये कि, जब तक क्रीटाणुओं को अनुकूल वातावरण नहीं मिलता वे नहीं पनपते, लाखों क्रीटाणुओं को पी लिया और उन्हें कुछ न हुआ।

१८७० में जब फ्रैंको-प्रशन लड़ाई छिड़ी तो इस सिद्धान्त की और भी परीक्षा होगई। लिस्टर ने घावों की सफाई पर बड़ा जोर दिया और इसका परिणाम यह हुआ कि घायल जर्मनी सिपाहियों के घाव जल्दी अच्छे हुए। एक वर्ष बाद लिस्टर ने जर्मनी से पाश्च्यो को एक पत्र लिखा जिसमें कि उसने पाश्च्यो की खोज स्वीकार की। इस पत्र से पाश्च्यो बड़ा उत्साहित हुआ।

पाश्च्यो की अगली विजय भेड़ और मवेशी में फैलने वाली बीमारी की रोक-थाम में हुई। जर्मनी में राबर्ट कोश इसी का अन्वेषण कर रहे थे।

उन्होंने सूक्ष्म-दर्शक यंत्र की सहायता से कीटाणुओं की जाँच की और पता लगाया कि अलग-अलग रोग के अलग-अलग कीटाणु होते हैं। उन्होंने हैजे के कीटाणुओं को छाँट निकाला और दूर-दूर देश में हैजे का प्रकोप रोका।

उधर पाश्च्यो ने अपनी खोज-बीन जारी रखी। अचानक ही उन्हें पता लगा कि हल्की शक्ति वाले कीटाणु शरीर में पहुंचाने के बाद शक्तिशाली कीटाणु असर नहीं करते। इङ्गलैंड में डाक्टर जैनर ने टीके लगाने की जिस प्रणाली का प्रारम्भ किया पाश्च्यो ने उसका अनुमोदन किया। इसके बाद पाश्च्यो ने पागल कुत्ते के काटे हुए एक लड़के की जान बचाई और इस रोग की रोक-थाम का तरीका निकाल लिया। आजकल हम सब लोग इन खोजों से लाभ उठा रहे हैं।

---

११. घावों की चीर-फाड़ में सफाई : लिस्टर और सैमैलवी की खोज

जिन दिनों फ्रांस में पाश्च्यो कीटाणुओं की खोज-बीन कर रहे थे उन्हीं दिनों जर्मनी में डाक्टर लिस्टर और हंगेरी में सैमैलवी भी इसी विषय की खोज में लगे थे। लेकिन इन तीनों में किसी को दूसरे का पता नहीं था। तीनों अलग-अलग कीटाणुओं के उस महान सिद्धान्त की खोज में लगे थे जिसने आगे चलकर अनेक रोगों की चिकित्सा सरल बना दी और घावों की चीर-फाड़ आसान कर दी।

शरीर के घावों की चिकित्सा में सफाई का सिद्धान्त कैसे मान्य हुआ इसकी कहानी बड़ी रोचक है। प्राचीन काल में भारतवर्ष, मिश्र, यूनान और रोम आदि देशों में घावों की चीर-फाड़ होती थी। किन्तु उन दिनों के औजार गंदे होते थे, घावों में जहर फैलकर बहुधा रोगी की मृत्यु हो जाया करती थी। बेहोशी की दवाइयाँ भी तब तक नहीं निकली थीं। उन दिनों के आपरेशन थियेटरों का नाम सुनकर लोग काँपते थे। सिंपसन ने जब बेहोशी की दवाइयाँ निकालीं तो घावों की चीर-फाड़ में पीड़ा का अन्त तो होगया लेकिन घावों

द्वारा फैलने वाले जहर की कोई रोक-थाम नहीं दिखाई दी। उन दिनों अस्पतालों में अधिकतर रोगी इस जहर फैलने से मर जाया करते थे।

घावों से फैलने वाले इस जहर की रोक-थाम का उपाय ग्लासगो के एक अस्पताल में जोसफ लिस्टर नाम के एक डाक्टर ने निकाला। उसका विश्वास था कि घावों की सूजन और उनमें फैलने वाला जहर एक विशेष प्रकार के कीटाणुओं द्वारा होता है। वे इन कीटाणुओं की उत्पत्ति और बढ़ोतरी रोकने में लग गये। अंत में उन्हें पता लगा कि कोल-तार से एक पदार्थ बनता है जो घावों को खराब नहीं होने देता। उन्होंने इस पदार्थ का नाम कार्बोलिक रखा। इस कार्बोलिक में चीर-फाड़ के औजार धोने और साफ करने के बाद, उसने देखा, कि घाव खराब नहीं होते।

यह एक बहुत बड़ी खोज थी। लिस्टर ने आपरेशन, थियेटर की पूरी सफाई रखी और उसके रोगियों में किसी का घाव खराब नहीं हुआ। अब तक जिस शत्रु पर विजय का कोई मार्ग दिखाई नहीं देता था उसे काबू में रखने का उपाय मिल गया।

हंगेरी के डाक्टर सैमैलवी भी इसी निष्कर्ष पर पहुँचे। लेकिन आरम्भ में उनका भी लोगों ने कड़ा विरोध किया और उनकी हँसी उड़ाई। रंज में वे पागल होगये और कुछ समय तक बड़े निराश रहे। किन्तु थोड़े दिनों बाद उनकी तबियत ठीक होगई और वे अपने प्रयोगों में फिर लग गये।

उधर फ्रांस में पाश्च्यो के प्रयोग और परीक्षाएँ चल ही रही थीं। इन तीनों का पुराने विचार के डाक्टरों ने घोर विरोध किया और तरह-तरह उनकी हँसी उड़ाई। लेकिन, अन्त में नये विचारों की सत्यता सिद्ध हुई और विरोधियों को हार माननी पड़ी।

कीटाणुओं के सिद्धान्त की जानकारी और उन्हें रोकने के उपायों का पता डाक्टरी की प्रगति में बड़ा महत्व रखते हैं। इनसे पहले छोटे-छोटे घाव भी भयंकर रूप धारण कर लेते थे; इनके बाद बड़े-से-बड़े घावों की चिकित्सा आसान होगई।

———

१२. दुनिया के चारों ओर संकेत ध्वनि : मोर्स और तार प्रणाली

तार द्वारा एक जगह से दूसरी जगह समाचार भेजने की प्रणाली निकालने का श्रेय अमरीका के सैमुअल फिनले ब्रीस मोर्स को है। उन्होंने २४ मई, १८४४ को, सबसे पहले, तार द्वारा एक जगह से दूसरी जगह समाचार भेजा।

एक जगह से दूसरी जगह समाचार कैसे भेजा जाय यह समस्या बहुत पुरानी है। प्राचीन काल में लोग ढोल बजा कर या धुँआ उठा कर संदेश पहुँचाया करते थे। एक पहाड़ी से दूसरी पहाड़ी पर जलती चिरागें दिखा कर भी संकेत किये जाते थे। ऊँची-ऊँची पहाड़ियों पर लकड़ियां अथवा मस्तूलों से भी संकेत भेजे जाते थे। लेकिन ये सब तरीके बड़े मामूली और सीमित उपयोग के थे। १६८२ में गैलिलियो ने चुम्बक सुई की सहायता से संकेत भेजने का सुझाव दिया था लेकिन इस ओर कोई विशेष प्रगति नहीं हुई। फिर १८२५ में विलियम स्टर्जन ने बिजली-चुम्बक (electro magnet) का आविष्कार किया। आगे चलकर इसी से तार भेजने की प्रणाली निकली।

तार भेजने की प्रणाली का आरंभ फ्रांस से अमरीका जाने वाले एक जहाज, Sully, पर हुआ। उस जहाज पर एक विद्यार्थी, सैमुअल मोर्स, योरोप से अमरीका लौट रहा था। बातचीत के सिलसिले में एक डाक्टर जैक्सन ने बिजली चुम्बक की चर्चा छेड़ दी। उसने बतलाया कि लोहे के चारों ओर लपेटे हुए तार में बिजली की लहर झटपट दौड़ जाती है। इस सूझ ने मोर्स को उधेड़-बुन में डाल दिया। वह सोचने लगा कि क्या यह संभव नहीं है कि बिजली की लहर द्वारा एक स्थान से दूसरे स्थान तक संकेत भेजा जा सके। जैक्सन ने मोर्स को यह भी बताया कि बहुत दिन पहले, बैन्जामिन फ्रैंकलिन ने नदी के आर-पार तार लगा कर बिजली की चमक से संकेत पहुँचाया था। मोर्स के लिये इतना संकेत काफी था। वह तन-मन से इसकी खोज-बीन में लग गया।

जब मोर्स न्यूयार्क पहुँचा तो दूसरे कामों से उनका जी हट चुका था।

वह विद्यार्थियों को पढ़ाता या चित्र बनाता तो उसका मन नहीं लगता। परिणाम यह हुआ कि उसके पास रुपये की कमी रहने लगी। वह बिल्कुल गरीब हो गया और चाय और बिस्कुट पर रहने लगा। जो कुछ उसे मिलता--पुरानी तस्वीरों के ढाँचे, पुराने लोहे के टुकड़े, कहीं से तार का टूक, टूटी हुई किसी घड़ी की कमानी--उसीसे वह अपना काम चलाता। कहा जाता है कि उसने एक बार अपने एक विद्यार्थी से पूछा कि वह ट्यूशन के पैसे कब देगा। जब विद्यार्थी ने अगले सप्ताह देने का वायदा किया तो मोर्स ने जवाब दिया "लेकिन, अगले हफ्ते तक तो मैं भूख से मर जाऊँगा।"

इस तरह वह दो वर्ष तक गरीबी से लड़ता रहा। अंत में उसका नमूना बनकर तैयार हो गया और वह उसे वाशिंगटन ले गया। वहाँ उसने कांग्रेस से ३०,००० डालर की मंजूरी देने की प्रार्थना की। वह दिनों, हफ्तों और महीनों इन्तजार करता रहा किन्तु कांग्रेस ने मंजूरी न दी। मार्च, १८४३ में उसके पास केवल १ डालर रह गया। उसे शंका और भय होने लगा कि उसका सारा परिश्रम निष्फल रहेगा। लेकिन कांग्रेस ने अपनी अंतिम बैठक में रकम मंजूर कर दी और वाशिंगटन और वाल्टीमोर के बीच में तार की लाइन बनना आरम्भ हो गया।

२४ मई, १८४४ को तार की लाइन बनकर तैयार हो गई। एक ओर वाल्टीमोर में मोर्स खड़ा हो गया और दूसरी ओर, चालीस मील के फासले पर, उसका साथी, अल्फ्रेड बेल। उस दिन दुनियां में पहला बार भेजा गया।

दो दिन तक लोगों का इस नये आविष्कार की महत्ता का पता नहीं चला। लेकिन जब दुनियाँ को पता लगा कि मोर्स के आविष्कार द्वारा दूर-दूर तक क्षण भर में संदेश भेजा जा सकता है तो उस पर धन और गौरव की चारों ओर से वर्षा होने लगी। थोड़े ही वर्षों में दुनियाँ के चारों ओर संदेश भेजने वाले तारों का जाल बिछ गया और एक जगह से दूसरी जगह समाचार भेजना बिल्कुल सरल हो गया। १७ अगस्त, १८५८ के दिन योरप और अमरीका के बीच अटलांटिक महासागर में केबिल तैयार हो गई और दुनियाँ के देशों के बीच की दूरी बहुत कम हो गई।

—०—

१३. दूर की आवाज : अलेक्ज़ेंडर बेल और टेलीफ़ून

आजकल साढ़े तीन करोड़ से भी अधिक टेलीफ़ूनों पर सारी दुनियाँ के लोग बातचीत करते हैं। आजकल हम टेलीफ़ून के इतने अभ्यस्त होगये हैं कि इसके बिना जीवन असम्भव मालूम होता है। लेकिन, शायद बहुत लोगों को यह मालूम नहीं होगा कि केवल ७० वर्ष पहले दुनियाँ में सबसे पहली बार अलेक्जेंडर बेल ने अपने साथी वाटसन से टेलीफ़ून पर कहा, "मिस्टर वाटसन, यहाँ आओ, मुझे तुम्हारी जरूरत है।"

अलेक्जेंडर का जन्म स्काटलैंड में हुआ था। उसके पिता बहरे बच्चों को होठों को देखकर कही हुई बातें समझने का अभ्यास कराया करते थे। अलेक्जेंडर भी इस काम में हाथ बँटाता। कुछ समय तक वह इस यत्न में लगा रहा कि बोली हुई बात को आँख से निशान देखकर कैसे समझा जा सकता है। इसके बाद उसका ध्यान इस ओर गया कि आवाज द्वारा बनाये गये निशानों को देखकर पढ़ने से दूर की बोली सुनना अच्छा रहेगा।

बेल से पहले कई लोगों ने इस ओर यत्न किया था। जर्मनी के हेम-होल्ज़ नामक आदमी ने दो प्यालों के बीच तार लगा कर आवाज़ सुनने की कोशिश की। चार्ल्स ह्वीट-स्टोन ने १८२१ में ऐसा ही एक प्रयोग किया। एक दूसरे जर्मन, फिलिप रीस ने चमड़े का यन्त्र बनाकर दूर की आवाज़ सुनने की कोशिश की।

बेल ने इन सब लोगों के परीक्षणों से लाभ उठाया। उसे एक साथी और मिल गया जिसका नाम वाटसन था। इन दोनों ने मिलकर टेलीफ़ून बनाकर तैयार किया।

आरंभ में इनके मार्ग में कठिनाइयाँ आईं। उन्होंने तरह-तरह से प्रयोग किये और अन्त में टेलीफ़ून बनकर तैयार होगया। १८७६ में बेल ने टेलीफ़ून का पेटेन्ट लिया। लेकिन कुछ समय तक लोगों ने इस नई मशीन का उपयोग न समझा। जब फिलेडेल्फिया में नुमायश हुई तो बेल भी अपनी मशीन लेकर वहाँ पहुँचा। वहाँ इसकी ख्याति हुई और चारों ओर बेल की प्रशंसा होने लगी।

आजकल हम प्रत्येक बड़े शहर में टेलीफून का जाल बिछा देखते हैं। यह सही है कि आजकल का टेलीफून बेल की मशीन से बहुत आगे बढ़ चुका है। इस बीच में एडीसन, डेविड ह्यूज, फ्रांसिस ब्लेक, हेनरी हनिंग्स आदि अनेक आदमियों ने इसके विकास में योग दिया है। लेकिन टेलीफून के आविष्कार का श्रेय अलेक्जेंडर बेल को है जिसने सबसे पहले दूर से सुनने की मशीन बना कर तैयार की।

———

१४. रेडियो का चमत्कार : मैक्सवैल, हर्ज और मार्कोनी की सूझ

टेलीग्राफ, टेलीफून और रेडियो—ये तीन दूर-दूर तक संदेश वाहन के साधन हैं। आजकल सारी दुनियाँ के ऊपर इन तीनों का जाल फैला हुआ है। लेकिन भविष्य में इनसे कितना लाभ उठाया जा सकेगा और इनमें कितना विकास होगा यह अभी तक नहीं कहा जा सकता। दिन प्रतिदिन नये-नये आविष्कार हो रहे हैं। टेलीविज़न जैसी चीजें सामने आ रही हैं। लेकिन इतना अवश्य कहा जा सकता है कि इस सारी उन्नति में इन तीनों का बड़ा महत्व है।

इनसे तीन आदमियों—एक अंग्रेज; एक जर्मन और एक इटलीवासी—के नाम सम्बन्धित हैं। ये तीन आदमी हैं जेम्स क्लार्क मैक्सवैल, हेनरिक हर्ज और गुग्लीमो मार्कोनी। मैक्सवैल ने बेतार के तार की भविष्यवाणी की और इसके सिद्धान्त का पता लगाया। हर्ज ने उन लहरों का पता लगाया जो वायुमंडल में स्पन्दन द्वारा आवाज़ ले जाती है। मार्कोनी ने इन लहरों को भेजने की मशीन बनाकर तैयार की और बेतार के तार को मूर्त रूप दिया।

मैक्सवैल का जन्म १८३१ में हुआ। वह प्रतिभायुक्त आदमी था और उसकी अन्तःप्रेरणा कहती थी कि प्रकाश और बिजली की लहरें, पानी की लहरों की तरह, एक गति से ऊँची-नीची चलती हैं। उसने प्रकाश और

१३. दूर की आवाज : अलेक्ज़ेंडर बेल और टेलीफून

आजकल साढ़े तीन करोड़ से भी अधिक टेलीफूनों पर सारी दुनियाँ के लोग बातचीत करते हैं। आजकल हम टेलीफून के इतने अभ्यस्त होगये हैं कि इसके बिना जीवन असम्भव मालूम होता है। लेकिन, शायद बहुत लोगों को यह मालूम नहीं होगा कि केवल ७० वर्ष पहले दुनियाँ में सबसे पहली बार अलेक्जेंडर बेल ने अपने साथी वाटसन से टेलीफून पर कहा, "मिस्टर वाटसन, यहाँ आओ, मुझे तुम्हारी जरूरत है।"

अलेक्जेंडर का जन्म स्काटलेंड में हुआ था। उसके पिता बहरे बच्चों को होठों को देखकर कही हुई बातें समझने का अभ्यास कराया करते थे। अलेक्जेंडर भी इस काम में हाथ बँटाता। कुछ समय तक वह इस यत्न में लगा रहा कि बोली हुई बात को आँख से निशान देखकर कैसे समझा जा सकता है। इसके बाद उसका ध्यान इस ओर गया कि आवाज द्वारा बनाये गये निशानों को देखकर पढ़ने से दूर की बोली सुनना अच्छा रहेगा।

बेल से पहले कई लोगों ने इस ओर यत्न किया था। जर्मनी के हेम-होल्ज़ नामक आदमी ने दो प्यालों के बीच तार लगा कर आवाज़ सुनने की कोशिश की। चार्ल्स व्हीट-स्टोन ने १८२१ में ऐसा ही एक प्रयोग किया। एक दूसरे जर्मन, फिलिप रीस ने चमड़े का यन्त्र बनाकर दूर की आवाज़ सुनने की कोशिश की।

बेल ने इन सब लोगों के परीक्षणों से लाभ उठाया। उसे एक साथी और मिल गया जिसका नाम वाटसन था। इन दोनों ने मिलकर टेलीफून बनाकर तैयार किया।

आरंभ में इनके मार्ग में कठिनाइयाँ आईं। उन्होंने तरह-तरह से प्रयोग किये और अन्त में टेलीफून बनकर तैयार होगया। १८७६ में बेल ने टेलीफून का पेटेन्ट लिया। लेकिन कुछ समय तक लोगों ने इस नई मशीन का उपयोग न समझा। जब फिलेडेल्फिया में नुमायश हुई तो बेल भी अपनी मशीन लेकर वहाँ पहुँचा। वहाँ इसकी ख्याति हुई और चारों ओर बेल की प्रशंसा होने लगी।

आजकल हम प्रत्येक बड़े शहर में टेलीफून का जाल बिछा देखते हैं। यह सही है कि आजकल का टेलीफून बेल की मशीन से बहुत आगे बढ़ चुका है। इस बीच में एडीसन, डेविड ह्यूज, फ्रांसिस ब्लेक, हेनरी हनिंग्स आदि अनेक आदमियों ने इसके विकास में योग दिया है। लेकिन टेलीफून के आविष्कार का श्रेय अलेक्जेंडर बेल को है जिसने सबसे पहले दूर से सुनने की मशीन बना कर तैयार की।

———

१४. रेडियो का चमत्कार : मैक्सवैल, हर्ज और मार्कोनी की सूझ

टेलीग्राफ, टेलीफून और रेडियो—ये तीन दूर-दूर तक संदेश वाहन के साधन हैं। आजकल सारी दुनियाँ के ऊपर इन तीनों का जाल फैला हुआ है। लेकिन भविष्य में इनसे कितना लाभ उठाया जा सकेगा और इनमें कितना विकास होगा यह अभी तक नहीं कहा जा सकता। दिन प्रतिदिन नये-नये आविष्कार हो रहे हैं। टेलीविज़न जैसी चीजें सामने आ रही हैं। लेकिन इतना अवश्य कहा जा सकता है कि इस सारी उन्नति में इन तीनों का बड़ा महत्त्व है।

इनसे तीन आदमियों—एक अंग्रेज; एक जर्मन और एक इटलीवासी—के नाम सम्बन्धित हैं। ये तीन आदमी हैं जेम्स क्लार्क मैक्सवैल, हेनरिक हर्ज और गुग्लीमो मार्कोनी। मैक्सवैल ने बेतार के तार की भविष्यवाणी की और इसके सिद्धान्त का पता लगाया। हर्ज ने उन लहरों का पता लगाया जो वायुमंडल में स्पन्दन द्वारा आवाज़ ले जाती है। मार्कोनी ने इन लहरों को भेजने की मशीन बनाकर तैयार की और बेतार के तार को मूर्त रूप दिया।

मैक्सवैल का जन्म १८३१ में हुआ। वह प्रतिभायुक्त आदमी था और उसकी अन्तःप्रेरणा कहती थी कि प्रकाश और बिजली की लहरें, पानी की लहरों की तरह, एक गति से ऊँची-नीची चलती हैं। उसने प्रकाश और

बिजली को लहरों की गति भी नाप ली। उसने पता लगाया कि प्रकाश लहरें एक सैकिन्ड में १ लाख ८६ हज़ार मील पहुंचती हैं।

मैक्सवैल की इस खोज से २३ वर्ष बाद हर्ज ने इसकी सत्यता सिद्ध कर ली। लेकिन अभी तक कोई ऐसा यंत्र नहीं बना था जो इन लहरों को बढ़ाकर फैला सके।

इस यंत्र को बनाने का काम मार्कोनी ने किया। मार्कोनी इटली का रहने वाला था और उससे पहले इसने शिक्षक प्रोफेसर रीघी, ने इस दिशा में कुछ प्रगति की थी। मार्कोनी ने अपने बाग में लट्ठे लगाकर तरह-तरह के प्रयोग किये। जब उन्हें उसकी सफलता पर विश्वास हो गया तो वे इंगलैण्ड गये और वहाँ अपने सिद्धान्त के प्रदर्शन किये। १८९७ में मार्कोनी वायरलेस टैलीग्राफ कम्पनी की स्थापना हुई और ब्रिटिश पोस्ट आफिस के अधिकारी प्रयोग करने के लिये तैयार हो गये। मार्कोनी ने ब्रिस्टल चैनल के आर-पार समाचार भेजकर अपनी मशीन की उपयोगिता सिद्ध कर दी। लेकिन अभी तक लोगों की एक शंका बनी रही। थोड़ी दूर तक तो बेतार के तार से समाचार भेजना आसान हो गया लेकिन हज़ारों मील की दूरी पर लोगों को शंका हुई, धरती का ढाल बाधा डालेगा। मार्कोनी ने इस शंका को भी दूर किया।

इसके बाद तो बेतार के तार का उपयोग दिनों दिन बढ़ता ही गया। आजकल इसके तरह-तरह के उपयोग हो रहे हैं और दिन प्रतिदिन इसका विकास होता जा रहा है।

—०—

१५. गुब्बारे से हवाई जहाज़ तक : आकाश में उड़ने का स्वप्न

मनुष्य सदा से पक्षियों की तरह आकाश में उड़ने का स्वप्न देखता आया है। यूनानी पुराणों में एक कथा मिलती है जिसके अनुसार डीडेलस और उसका पुत्र, इकारस सम्राट मिनोस के भय से आकाश में उड़ गये किन्तु सूर्य के निकट पहुँच जाने के कारण उनके पंख झुलस गये। मध्य युग में भी

आकाश में उड़ने की आकांक्षा बनी रही। पन्द्रहवीं-सोलहवीं सदी में जब नव-जागृति फैली तो लोग आकाश में उड़ने के तरह-तरह के उपाय सोचने लगे। रोजर बेकन ने पोले डंडों में हवा भरकर उड़ने का यत्न किया। प्रसिद्ध कलाकार लिओनार्डो डि बिन्सी ने चिड़ियों के परों को देखकर उनके अनुसार उड़ना चाहा। इटली के एक निवासी के बारे में सुना जाता है कि वह पर लगा कर उड़ा था। इस तरह एक पीढ़ी से दूसरी पीढ़ी तक उड़ने का यह स्वप्न बराबर आगे बढ़ता रहा।

इसके बाद गुब्बारों के प्रयोग आरम्भ हुए। सबसे पहले फ्रांस में दो भाइयों ने इस ओर प्रयत्न किया। उनके यहाँ एक चक्की चलती थी उसके धुंए को ऊपर उठता देखकर उन्हें खयाल आया कि अगर रेशमी गुब्बारे में धुँआ भर दी जाय और उसमें नीचे एक आदमी बैठ जाय तो वह आकाश में ऊपर उड़ सकता है। उन दोनों भाइयों ने दो बार इस तरह आकाश में उड़ने की चेष्टा की। दो वार वे ६० फीट उड़े और दूसरी वार ६० हज़ार फीट। इसके बाद फ्रांस के सम्राट, लुई की उपस्थिति में यह प्रयोग हुआ। दो अभियुक्तों को, जिन्हें मृत्यु दण्ड की सजा थी, गुब्बारे में बैठाकर उड़ाने की योजना बनाई गई। लेकिन एक आदमी उड़ने के लिये अपने आप तैयार हो गया। वह आसमान में उड़ने वाला पहला आदमी था। इन गुब्बारों को धरती पर एक रस्सी से बाँध दिया जाता था।

इसके बाद, बिना रस्सी बाँधे, एक आदमी उड़ा जिसका नाम मार्किस द आर्लेन्डो था। उसके गुब्बारे में आग लग गई लेकिन शीघ्र ही बुझा दी गई। वह दुबारा उड़ा और फिर उसके गुब्बारे में आग लग गई और वह मारा गया। वह लगभग ९ मील हवा में उड़ता रहा।

अठारहवीं सदी में लोगों ने हवा में उड़ने के और प्रयत्न किये लेकिन किसी को सफलता न मिली। उन्नीसवीं सदी में तीन अंग्रेज इजनीअरों ने इस ओर प्रयत्न किये। जार्ज कैले ने ५० वर्ष तक प्रयत्न किया किन्तु उसे सफलता न मिल सकी। हेनसन ने अपनी सारी सम्पत्ति लगा कर एक हवाई जहाज बनाया। जान स्ट्रिंगफैलो ने भी सफलता पूर्वक एक हवाई जहाज बना लिया। लेकिन सबसे बड़ी समस्या तो उसमें बैठकर उड़ने की थी।

एक जर्मन वैज्ञानिक ओटो लिलिन्थल ने बीस वर्ष तक चिड़ियों के पंखों को देख-देखकर अनेक नमूने बनाये और १८९१ में उसे सफलता मिली। उसने लगभग दो हजार उड़ानें ली और अन्त में वह मारा गया।

इसके बाद राइट-बन्धु प्रयोग करते रहे। उन्होंने पहले एक हवा की पोली खोह बनाई और उसमें प्रयोग किये। दो वर्ष बाद उन्होंने दो पंखों वाला एक हवाई जहाज बनाया और १९०३ में उड़ने का प्रदर्शन किया।

दो वर्ष बाद राइट-बन्धु २५ मील उड़ने में समर्थ हुए। १९०८ में वे ५१ मील उड़े। अगली साल उन्होंने हवाई जहाज में इंगलिश चैनल पार की।

इसके बाद आकाश में उड़ने की नयी-नयी मशीनें बनने लगीं और तरह-तरह के सुधार हुए। आजकल तो हवाई जहाज ५०० मील प्रति घंटे हज़ारों मील तक उड़ सकते हैं।

---

१६. रेड क्रास : हेनरी ड्यूरां की सूझ

अब से कोई सौ वर्ष पहले, २४ जून १८५० की बात है। नैपोलियन तृतीय ने, सारडोनियां वालों की सहायता से, सौफ़ीनो के मैदान में एक बड़ी भयंकर विजय प्राप्त की जिसमें आस्ट्रिया के हज़ारों सिपाही मारे गये और चालीस हज़ार से अधिक घायल हुए।

उन्हीं दिनों फ्रांस का एक धनी आदमी अपने व्यापर में फ्रांसीसी सरकार से कुछ सुविधा चाहता था। उसने सोचा विजय की खुशी के इस अवसर पर सम्राट से प्रार्थना करना अच्छा रहेगा। इसलिये वह सम्राट के पास लड़ाई के मैदान में ही जा पहुँचा। वहाँ उसकी सम्राट से तो मुलाकात नहीं हो सकी लेकिन उसने लड़ाई के मैदान में घायलों की जो हालत देखी उससे उसका कलेजा काँप उठा। उसने अपने कुछ साथियों को लेकर घायल सिपाहियों की सेवा-सुश्रूषा आरंभ कर दी। रेडक्रास के आरम्भ का यही इतिहास है।

इसके बाद ड्यूरां ने एक पुस्तक लिखी जिसमें उसने लड़ाई के मैदान

का आँखों देखा हाल लिखा। इस पुस्तक को उसने अपने मित्रों के पास मुफ्त भेजा। इसे पढ़कर लोगों के दिल हिल उठे और एक सम्मेलन बुलाने की योजना तैयार होगई। इस सम्मेलन का उद्देश्य लड़ाई में घायल हुए सैनिकों की सुश्रूषा करने के उपाय ढूँढ़ना था।

सम्मेलन की सफलता के लिये ड्यूरां घर-घर फिरा और आदमी-आदमी से उसने सहायता की प्रार्थना की। सम्मेलन में अब्राहम लिङ्कन के दो प्रतिनिधियों ने भाग लिया। यद्यपि फ्रांस का युद्ध-मंत्री ड्यूरां की पुस्तक से चिढ़ा हुआ था तब भी फ्रांस के सम्राट, नैपोलियन तृतीय से सम्मेलन को प्रोत्साहन मिला।

१८६३ में, जिनेवा में पहला सम्मेलन हुआ जिसके सभापति मोनियर और सेक्रेटरी ड्यूरां थे। अगली साल स्विटज़रलेंड की सरकार ने सम्मेलन अपने यहाँ बुलाया और घायल सैनिकों की देख-भाल के लिये कुछ नियम निश्चित किये गये।

जब जर्मनी ने डेनमार्क पर आक्रमण किया तो घायल सैनिकों की सुश्रूषा करने वाले एक डाक्टर ने अपने हाथ पर पहचान के लिये रेडक्रास का बिल्ला लगा लिया। रेडक्रास तभी से चल पड़ा।

रेडक्रास आन्दोलन थोड़े ही दिनों में देश-देश में फैल गया किन्तु लोग इसके संस्थापक, ड्यूरां को भूल गये। दुर्भाग्य से ड्यूरां का व्यापार भी ठप्प होगया और वह भिखारी की तरह इधर-उधर फिरने लगा।

१८७१ में रेड क्रास की अन्तर्राष्ट्रीय सभा रोम में होने वाली थी। उस वर्ष ड्यूरां, लम्बे बाल और दाढ़ी बढ़ाये, इटली के छोटे से गाँव हीडन में आ निकला। वहाँ पर गाँव के शिक्षक और उसकी पत्नी से ड्यूरां की ज़ान-पहचान होगई। शिक्षक ने पत्र द्वारा रेड क्रास सम्मेलन को ड्यूरां की सूचना भेजी। ड्यूरां ने स्कूल मास्टर से रोम के सम्मेलन में भाग लेने का अनुरोध किया लेकिन रुपये की कमी के कारण ऐसा न हो सका। ड्यूरां ने धन इकट्ठा करने का प्रयत्न भी किया लेकिन उसे सफलता न मिली।

सम्मेलन ने जब ड्यूरां का समाचार सुना तो उन्हें बड़ा खेद हुआ। ड [illegible] आदमी के साझे में नोबेल पुरस्कार दिया गया। लेकिन

१८. सब चीजों पर समान अधिकार :
प्लेटो से लेकर स्टालिन तक साम्यवाद

आजकल साम्यवादी विचारधारा का बड़ा जोर है। इस विचारधारा की झलक हमें प्लेटो के समय में भी मिलती है और उसके बाद समय-समय पर लोगों ने साम्यवाद से मिलते-जुलते विचारों की पुष्टि की है। लेकिन साम्यवादी विचारधारा को स्पष्ट करने का श्रेय मार्क्स और एन्जेल्स को है। इन दोनों दार्शनिकों ने साम्यवाद पर गम्भीर विचार किया और दुनियां के सामने जीवन का एक नया तरीका रखा। इस नये तरीके से सब चीजों पर सब लोगों का समान अधिकार रहता है।

मार्क्स और एंजेल्स की जीवनियाँ बड़ी प्रभावोत्पादक हैं। मार्क्स जर्मन था और आरम्भ में पत्रकारी करता था। धीरे-धीरे उसने क्रान्तिकारी विचारधारा विकसित की और अपने विचार दुनियां में फैलाये। तत्कालीन जर्मन सरकार को मार्क्स के विचार अच्छे न लगे और उसका अखबार जब्त कर लिया गया। जर्मनी से भाग कर मार्क्स ने पेरिस में शरण ली और वहाँ अपने क्रांतिकारी विचारों का प्रचार प्रारम्भ कर दिया।

पेरिस में मार्क्स की एंजेल्स से मित्रता हुई। एंजेल्स समृद्ध व्यापारी था लेकिन उसने नयी विचारधारा के लिये सब कुछ बलिदान कर दिया और मार्क्स के साथ काम करने लगा।

१८४७ में मार्क्स और एंजेल्स ने मिलकर "The Communist Menifesto" नाम की पुस्तिका प्रकाशित की। इस पुस्तक में उन्होंने अमीर और गरीबों का संघर्ष प्रगट किया और साम्यवाद का समर्थन किया। उनके अनुसार संसार के सारे संघर्ष, सारी लड़ाइयाँ, सारे झगड़े इसी संघर्ष के कारण होते हैं।

१८४८ में फ्रांस, जर्मनी और योरप के दूसरे हिस्सों में क्रांति के विस्फोट आरम्भ हो गये। मार्क्स और एंजेल्स क्रांतिकारियों को सहायता देने जर्मनी पहुँचे। उनका विश्वास था कि जर्मनी में क्रांति सफल होगी लेकिन वहाँ वे निराश हुए और लौट आये।

अगले ३९ वर्षों में मार्क्स अपनी पत्नी के साथ साम्यवाद का अध्ययन करते रहे। ये वर्ष बड़ी कठिनता के दिन थे। मार्क्स को गरीबी और बीमारी का सामना करना पड़ता था और छिपे-छिपे अपनी विचारधारा विकसित करनी थी। अन्त में उन्होंने अपनी प्रसिद्ध पुस्तक "पूँजीवाद" का पहला भाग प्रकाशित किया। दूसरा भाग उनकी मृत्यु के बाद एंजेल्स ने पूरा किया।

साम्यवाद का सफल प्रचार रूस में हुआ। वहाँ पर मार्क्स को लेनिन और स्टालिन जैसे अनुयायी मिले जिन्होंने मार्क्सवादी विचारधारा के अनुसार एक नया समाज बना कर खड़ा कर दिया।

जिस समय प्रथम महायुद्ध (१९१४-१८) आरम्भ हुआ तो लेनिन जर्मनी में था। वहाँ की सरकार ने उसे रूस जाने की आज्ञा दे दी। रूस में आकर लेनिन ने जनता को जार के विरुद्ध भड़काया और रूस में जारशाही का अन्त हो गया। इसके बाद लेनिन ने जर्मनी से सन्धि कर ली।

रूस की क्रांति बड़ी कठिनाइयों से सामना करने के बाद हुई। योरप के दूसरे देश पुरानी सत्ता के पक्षपाती थे और क्रांतिकारियों को उनसे किसी प्रकार की सहायता की आशा नहीं थी। लेकिन रूसी जनता बड़ी लगन के साथ क्रांति को सफल बनाने में लगी रही।

१९२४ में लेनिन की मृत्यु हो गई और उनके कार्य क्रान्ति को सफल बनाने का भार स्टालिन के कंधों पर आ पड़ा। स्टालिन ने बड़ी निष्ठा और दृढ़ता से काम किया और साम्यवाद रूस में प्रतिष्ठित हो गया।

रूस में साम्यवाद के साथ ही जर्मनी और इटली में तानाशाही ज़ोर पकड़ती गई। लेकिन द्वितीय विश्वयुद्ध में तानाशाही का अन्त हो गया और साम्यवाद और भी प्रबल हो गया। इस समय संसार में दो विचारधारायें हैं—एक जनतंत्रवादी और दूसरी साम्यवादी। देखें इन दोनों में किसकी विजय होती है ?

———

१६. राष्ट्रों से भी ऊँचा स्वप्न

१७८२ में, सात वर्ष की लड़ाई के बाद, अमरीका इंगलैंड के

स्वामित्व से मुक्त हो गया और अमरीका की तेरह रियासतें स्वतन्त्र हो गईं। स्वाधीनता की इस लड़ाई में वाशिंगटन ने नेतृत्व किया था। लड़ाई के बाद जनता ने उसको सम्राट बनाना चाहा किन्तु उसने यह गौरव अस्वीकार कर दिया।

स्वाधीन होते ही अमरीका के तेरह राज्य आपस में झगड़ने लगे। इस झगड़े का एक कारण यह भी था कि लड़ाई के बाद व्यापार मंदा पड़ गया और लोग एक दूसरे पर झल्लाने लगे। मित्र-संघ (League of Friendship) राज्यों के आपसी झगड़ों को न निबटा सका। दिनों-दिन कटुता बढ़ती गई और ऐसा मालूम होने लगा कि गृह-युद्ध छिड़ने वाला है।

ऐसी हालत में १७८६ में एक सम्मेलन बुलाया गया और बिगड़ती हुई दशा पर विचार करने का सुझाव दिया गया। १३ राष्ट्रों को मिला कर एक राष्ट्र-संघ बनाने की योजना सामने रखी गई और हैमिल्टन के पत्र The Federalist ने इस योजना का प्रचार किया।

अगले वर्ष, १७८७ में सम्मेलन हुआ और अमरीका की स्वाधीनता के घोषणा-पत्र पर हस्ताक्षर हुए। शुरू-शुरू में सम्मेलन के सामने एक कठिनाई यह थी कि राज्यों के प्रतिनिधि अपने-अपने राज्यों के अधिकारों को किसी प्रकार सीमित नहीं करना चाहते थे। लेकिन वाशिंगटन ने लोगों को बताया कि उन्हें अपने-अपने राज्यों की बात छोड़ कर अमरीका के बारे में सोचना चाहिये। यह बात लोगों के घर कर गई और प्रतिनिधियों ने प्रसन्नता पूर्वक राष्ट्र-संघ बनाना स्वीकार कर लिया।

अमरीका का राष्ट्र-संघ सफल हुआ और आज वह संसार की सबसे शक्तिशाली सत्ता है। हम इस आदर्श को और भी आगे बढ़ा सकते हैं। अगर अलग-अलग राष्ट्रों के लोग अपने अपने राष्ट्रों के हितों की चर्चा छोड़ कर सारी मानवता के हित की बात सोचने लगें तो संसार में शान्ति स्थापित हो जाय।